DECEMBER 1984 VOL. 10 NO. 12 $2.95

Creative Computing

THE #1 MAGAZINE OF COMPUTER APPLICATIONS AND SOFTWARE

PROGRAMMING TECHNIQUES

IN-DEPTH EVALUATIONS:

IBM PC AT
Tandy Model 1000
Panasonic Sr. Partner
Sinclair QL
ITT Xtra
STM PC
Tandy Disk/Video Interface

SPECIAL SECTION:

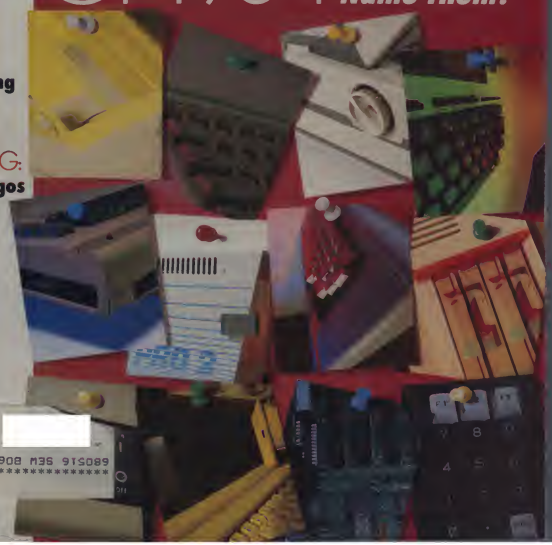
Choosing And Using A Word Processor

FOCUS ON PROGRAMMING:

Comparison Of Logos
Improving The Apple LIST Command
Branch And Bound Techniques
Indexing With A Microcomputer
Sprites in Simon's Basic

TOP 12 COMPUTERS OF 1984

Can You Name Them?



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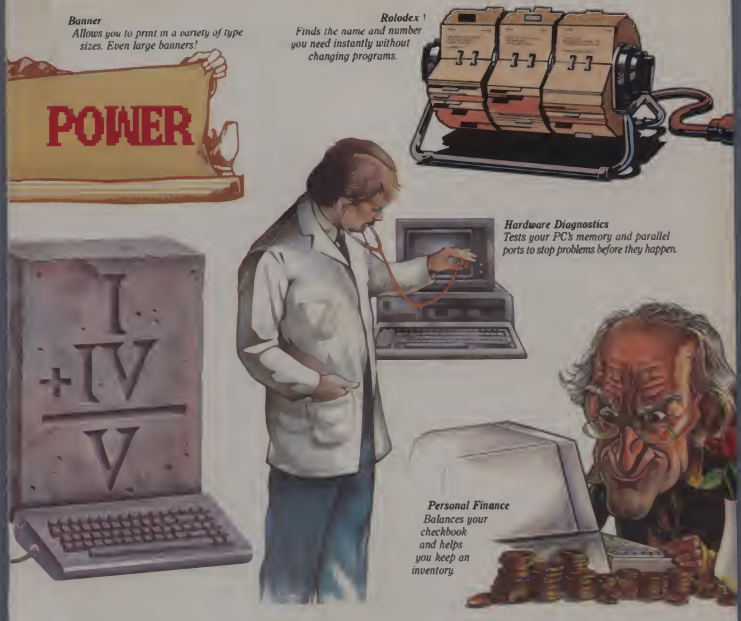
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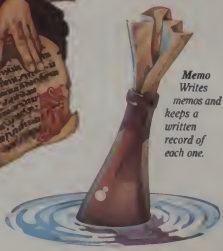

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A BUREAUCRAT'S GUIDE TO WORD PROCESSING

Now, if it were you or I and we wanted a word processing program for our IBM-type PC, we'd probably stop off at our local computer store and simply diddle with a few.

You and I, however, are not the U.S. Department of Agriculture.

(Nor any of its permutations of subsystems like the Economic Research Service, National Resources Economics Division, Data Services Center, etc., etc.)

So when the USDA told ERS to tell NRED and DSC to look into a truckload of w.p. programs for all their PCs, the last thing they wanted was simple diddling. Their dedicated Wangs and Lexitrons were far too few to handle their needs, their IBM® PCs weren't compatible with them anyway, and nobody really, quantifiably, knew from word processing with a personal computer.

Definitely not a diddling-mode condition.

As they put it in The Exchange, an internally distributed publication of the Department of Agriculture: "A needs assessment showed that, in the long-term, a word processing system is needed that can increase word processing capability and also be compatible with ERS' Long Range Information Management goals."

Well, "Needs assessment" led swiftly to "procurement action," which galloped into an "objective review" of the eight top-rated PC programs on the market (as compiled by The Ratings Book published by Software Digest), along with Wordstar® and Display Write 2, because they had some around.

Thus armed with the names, the final evaluators (a team of secretaries from NRED who would be the primary users of the PC software) became armed with each of the programs, along with checklists to record such things as ease of use, advanced features, and similarity to their existing dedicated equipment.

The first to be eliminated from the prospect list were Office Writer™ and Samna,™ since they're copy-protected and couldn't be transferred to hard disks.

Next, IBM's Display Write 2: because it's "not compatible with other software used in ERS (like Lotus 1-2-3,™ dBASE II,® etc.)," and it's "full of confusing menu options and cryptic error messages." Au revoir IBM.

Then, three more, for a variety of reasons.

Which left the following:

Volkswriter® Deluxe™
MultiMate™
Leading Edge™

Volkswriter Deluxe? "Too complicated and confusing." Not "easy to learn or use."

MultiMate? Not bad. It actually tied the winner in a few categories.

The winner being the one that won 82% of the votes in the Ease of Use/Ease of Learning categories. The one about which they said, "The ability to store deleted text and automatic document backup features were both highly desirable." The one they thought they'd quickly "be able to use . . . for their day-to-day word processing tasks."

The whole process took some three months of work by people in DSC to support the NRED in its work with the ERS and DSC to make the world a better place for the USDA.

But the results were well worth the wait. Because at last they've solved their word-processing problems . . .

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THESE ARE THE PACKAGES THE COMMITTEE EVALUATED:

THESE WERE THE FINALISTS:

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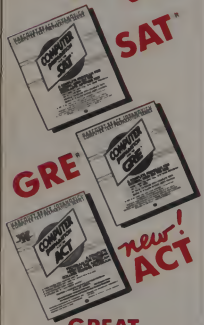

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INPUT/ OUTPUT

An Eye-Opener

Dear Editor:

My hat is off to you for your superb review of *Women's Ware* in the September issue of *Creative Computing*. First and foremost, it was the most appropriate—and inspired—way of handling the product and its appalling assumptions. Let us hope it opens some eyes at a number of software companies.

Second, to me as an editor your review restores a certain amount of my faith in consumer computer magazines. I had begun to wonder whether they had an express policy against printing honest reviews for fear of offending potential advertisers.

Keep up the good work—and your policy of writing first for your readers.

Trudy E. Bell
Senior Associate Editor
Spectrum Magazine
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Mom Replies

Dear Editor:

Somehow this letter turned up in my office for your reviewer Elizabeth Staples; I hope you will forward it to her.

* * *

Dear Betsy,

Thanks for your newsy letter about that cute new software product, *Women's Ware*. (Next time, though, dear, why don't you send your letter on disk so I can excerpt parts I want to save on my database system?) How wonderful to have software just for us computer dummies!

Your letter came just as I was writing that computer learning program for the kids we talked about, with adventures involving their toys, animals, and friends. (I can hardly wait for the structured BASIC we read about to become available for this, can you?) Anyway, you're right that *Women's Ware* is just what we women who can't figure out how to keep our recipes in a card file need.

And you know what? You gave me an idea for a product called *Jockware*. Remember how Dad outlined his tools in paint on his tool board so he could see immediately any tool that was missing? A database system could manage that. I would also build in a scheduling system for watering the lawn, carrying out the trash, and taking Sonny fishing. What do you think about building in sports records and a quiz? The dummies would pay $70 for something they could get in a $3 paperback, don't you think? Anyway, let's market it in our software sideline.

Not much news here. Our women's circle here has been using our word processors to develop a local-issues pamphlet on battered wives and to write modular letters to congress members; having that communications program sure helps in passing around drafts on disk. Your Aunt Sally's group has been using a spreadsheet program to project the women's health center fundraising needs for the next five years; the graphics program they got makes it real clear, by the way.

Well, it certainly is about time they had software to meet women's needs—and I'll bet that it will save as much time for the housewife as Heloise's many tips on how to re-use plastic bags, nylon net, and meat trays. But one thing I'm especially sure of—it's great that you're the one reviewing these products for *Creative Computing*!

Love, Mom

* * *

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LETTERS (CONT'D)

Flowchart Fanatic

Dear Editor:

After reading parts 1 through 3 of "Structured Programming in Basic," I have come to the conclusion that author Arthur Leuhrmann is very well versed in Basic and the concepts behind structured programming. However, my regard for his expertise was diminished considerably by his reference to flowcharts as "crutches."

I would hate to see Mr. Luehrmann struggling with 5000 to 10,000 lines of code without a flowchart. A crutch indeed! In large corporations and government agencies, the person who actually codes a program frequently is not even present at its conception. The program starts out on a flowchart and, as the idea emerges, that flowchart expands until the entire program is conceptualized. The flowchart (or charts) is then given to a programmer who codes it in the chosen language.

So, this program developer/programmer will keep his "crutches" and advise all serious programmers to do the same.

Joe V. Bolin
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I understand your feelings about flowcharts; I also used to think they were essential for planning any large program. However, the best evidence today is that such practices are part of the problem, not the solution. Flowcharts are needed as long as undisciplined use of GOTO and IF statements are tolerated. Once these statements are tamed, flowcharts are of little use.

The reason for this is simple: In the structured use of GOTO and IF statements, only two kinds of structures are allowed: loop blocks and branch blocks. All control problems are solved with these two, either separately or in nested combinations. Therefore, the flowchart of a well-structured program is nothing but combinations of two fundamental flowgraphs—those for loops and those for branch blocks. Since these elementary flowgraphs are so simple, there is no point in drawing them on a chart.

In closing, all I can say is what I said in the article: Try it; the only thing you have to lose is your flowcharts. —AL

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CIRCLE 133 ON READER SERVICE CARD

DAVID H. AHL

TOP 12 COMPUTERS OF 1984

Well, calendar year 1984 has finally managed to put itself into the past as opposed to the future, and despite old Georgy Orwell, we don't seem all that much worse for wear. It has been a good year for the computer industry, despite somewhat less explosive growth than some pundits had predicted. For the consumer, it has been a very good year—more capabilities became available for less money than ever before.

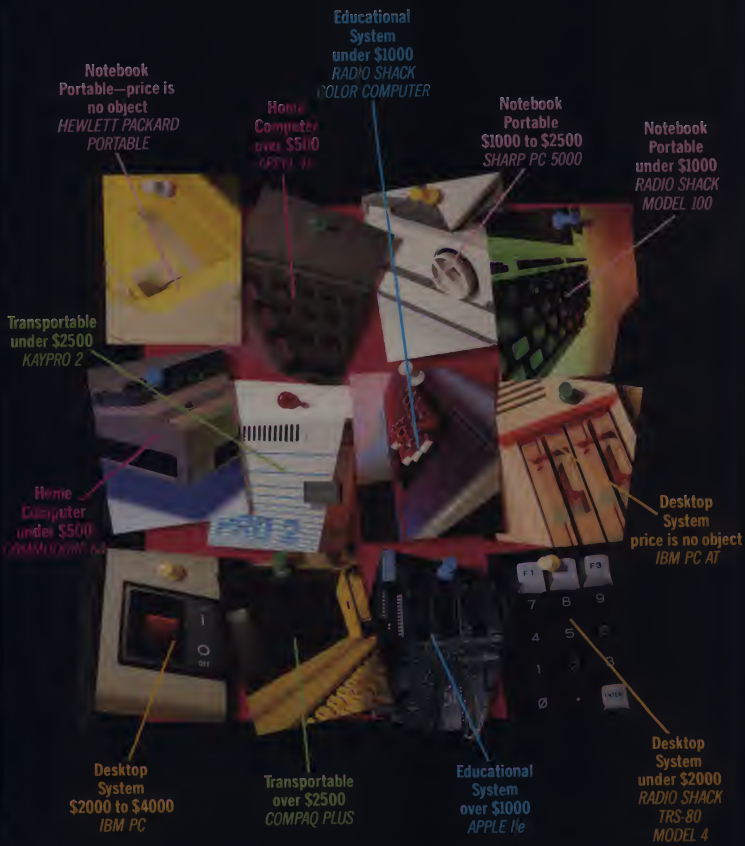
Now a wider range of choices are available in every segment of the industry. We took a categorized look at these choices, and polled our editors to discover their favorites. Without further ado, we now present the 12 best computers of 1984.—JJA

The title of this piece probably should have been, "Our Pick For the Best Computer in Each of 12 Categories From Those Computers Available in Late 1984." However, that title didn't exactly roll off the tongue. Nevertheless, we probably should specify the ground rules of this competition.

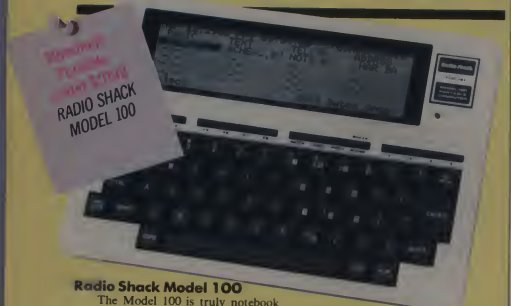
Our criteria for choosing the best computer in a category were very similar to those a prospective purchaser might have. We did not just look at the number of bits in the processor, computational speed, graphics resolution, and other easily measured variables. Rather, we tried to consider how well a computer was likely to meet the needs of a user.

As a result, we looked at the machine itself including the internal and external specifications, quality of assembly, and expected reliability. We considered the ease of use, ease of set-up and interconnection, and clarity of the documentation. We also considered how widely the machine was, or is likely to be, available and where it could be serviced. We took software into account: how much is available both from the manufacturer and from third party vendors, and how easy it is to write your own. Finally, we considered the manufacturer: do they provide appropriate support, does their marketing make sense, and are they likely to be around for the next five years?

We asked the editors-in-chief of the Ziff-Davis computer magazines to vote along with our own editors in each of the 12 categories for the best computer and runner-up. We also asked for each one's choice of the best all-around system


Notebook Portable—price is no object
HEWLETT PACKARD PORTABLE
Home Computer over $500
Educational System under $1000
RADIO SHACK COLOR COMPUTER
Notebook Portable $1000 to $2500
SHARP PC 5000
Notebook Portable under $1000
RADIO SHACK MODEL 100
Transportable under $2500
KAYPRO 2
Home Computer under $500
Desktop System price is no object
IBM PC AT
Desktop System $2000 to $4000
IBM PC
Transportable over $2500
COMPAQ PLUS
Educational System over $1000
APPLE IIe
Desktop System under $2000
RADIO SHACK TRS-80 MODEL 4

We thought it might be nice to let the winners take a quick victory lap around the magazine, so we can clearly remember what makes them the best. Culled from reviews appearing in Creative Computing over the past year, here is a brief look at each of the machines that constitute the "crème de la crème" in microcomputing hardware for 1984.



Radio Shack Model 100

The Model 100 is truly notebook size (8.5" x 12" x 2.2") and weighs just under four pounds. It incorporates a full-size, full-stroke keyboard, with four special keys, eight function keys, and four cursor keys (in an unfriendly straight line).

The display is the largest on any notebook computer, 2" x 7.5", and displays eight lines of 40 characters each. The character size is large and legible. Graphics within a 64 x 240 pixel matrix are also possible. A built-in speaker plays notes over a five-octave range.

The Model 100 uses a CMOS version of the Z80 running at 2.5 MHz. Since default mode in Basic is double precision, the machine was very slow in running our benchmark; on the other hand, it scored high in the accuracy department. It has only 8K of RAM built in, but a 24K version is available. Both can be further expanded to 32K. An external cassette recorder provides mass storage.

The computer provides an impressive array of I/O ports. On the back are connectors for Centronics parallel printer, RS-232 serial device, cassette recorder, bar code reader, and modular telephone jack.

The Model 100 has a built-in direct-connect modem which can plug into any telephone jack. Coupled with the communications software package, it provides many of the features of a so-called "smart" modem—auto-dial, log-on, download, and upload—although it does not have wake up and auto-answer.

The Model 100 has five programs built in. Microsoft Basic is missing a few commands and does not have on-screen editing (except by means of the text editor—a cumbersome process). The text editor is an adequate package. It is always in insert mode, and has cut, paste, search, and other rudimentary features. It does not have an output formatter, but several are available from third party vendors.

The communications package was mentioned above. The last two packages, schedule organizer and name/address organizer, are simply special versions of the text editor with certain commands locked out. We have not found them particularly useful.

Many software packages have been introduced by third party vendors. The availability of software coupled with the integrated packages built into the machine make the Model 100 an attractive choice for a wide varity of users. Poor Basic program editing and lack of an output formatter are small drawbacks against the many enticing capabilities and attractive price of the computer.

regardless of category or price. Hence, we had 13 very knowledgeable people selecting the winners. In the case of ties or close contests, the final decision was made by us at *Creative Computing* and, in two cases, by me personally.

What the voting indicated is that the choice of a personal computer is, indeed, a very personal thing. To some people, the technology is the important thing (a Porsche over a Buick any day of the week); to others, memory and disk capacity is crucial (Vanwagon over a Civic); while to others, software and support come first (Chevy over a Fiat). However, when the dust settled, one machine emerged at the top—sometimes just barely—in each category. In the individual writeups, we will mention the close contenders and near winners.

Notebook Portables —Under $1000

This category emerged with a very clear winner, but nearly everyone commented, "If such-and-such had only done this," or "I really liked the XYZ, except for . . . "

The clear winner is the Radio Shack TRS-80 Model 100. Current list price is $599 for the 8K version and $799 for the 24K version. We feel that the 8K version is practically useless, and that 24K is needed for any serious word processing or computing.

Closest runner-up was the NEC PC-8201, very nearly a twin brother of the Model 100. The 8201 has some advantages over the Model 100 (cursor control keys laid out in a logical diamond pattern, more memory, direct on-screen

The Model 100 emerged as the leader because of its built in modem, more compact size, third-party support, and good distribution.

editing of Basic programs, and optional plug-in memory cartridges). Nevertheless, the Model 100 emerged as the leader because of its built in modem, slightly more compact size, more support by third-party software manufacturers, and considerably better retail distribution.

Other notable contenders in this category included the Sord IS-11 and Epson PX-8. We liked the built-in software and microcassette recorder of the Sord, but we haven't seen much evidence

of widespread availability. The Epson PX-8 could be a future winner with its "real" operating system (CP/M) and software packages scaled down from desktop machines, assuming it does not suffer from the lackluster marketing lavished by Epson on the HX-20.

Notebook Portable —$1000 to $2500

Except for a few enthusiasts who thought the Apple IIe belonged in this category (maybe it will when the LCD display is available), our editors were remarkably consistent in choosing the Sharp PC-5000 as the winner in the $1000 to $2500 range. Actually, there was a bit of grumbling because while most thought that the Sharp computer was a wonderful piece of hardware, they were equally disappointed with the lack of retail availability and questionable support from both the manufacturer and third party vendors.

At Sharp, positions with the computer group seem to be connected with a revolving door; as a result, the company has never quite gotten its act together. On the other hand, Sharp has just reduced the price of the PC-5000 to $1995 including the printer, thus making it an even more attractive buy.

Notebook Portable —Price is no Object

Although in this category we say, "price is no object," that does not mean that we didn't consider price in our overall judgment in arriving at a winner. In some cases, the highest priced computer is truly the best. On the other hand, sometimes a doubling of the price buys features that are only marginally better. Consider: if you are looking for a speedy car, is the Ruf Porsche 930 Turbo (186 mph, $58,780) worth nearly twice as much as the Porsche 928S (162 mph, $33,395)? To some people it is; to others it isn't.

In judging computers in the "price is no object" categories, we considered features; however, in the end, we ranked value per dollar more highly than features alone.

This category (and one other) had the highest unanimity in the voting. The overwhelming winner was the Hewlett Packard Portable. It has nearly everything you could wish for: true 16-bit CMOS 8086 mpu, 272K of RAM, 384K of ROM with *Lotus 1-2-3* and *MemoMaker* built in, gobs of software, excellent HP support, and a surprisingly modest price ($2995).

Sharp PC-5000

The Sharp PC-5000 is one of the largest of the notebook computers, but it is packed with features and capability. It has a large screen (eight lines by 80 characters), full keyboard, 16-bit processor, 128K memory, and much more.

The PC-5000 uses a 16-bit 8088 mpu, the same as in the IBM PC. MS-DOS and Microsoft GW Basic reside in 64K of ROM, and 128K of RAM is available for user memory, expandable to 256K. Mass storage is in the form of a 128K bubble memory cartridge or, if you prefer, an external cassette recorder. In a non-portable mode, the PC-5000 also supports a double-density, double-sided floppy disk drive.

With the 16-bit processor, the PC-5000 is fast—close to the fastest computer we have ever tested, portable or not. A second control mpu controls the I/O functions, further contributing to the throughput.

The LCD screen measures 1.3" x 9.3" and displays eight lines of 80 characters or graphics in an 80 x 640 pixels field. Characters are about the same size as dot matrix printer output—small, but readable.

The keyboard has 57 full-stroke keys, three special keys, eight dual-meaning function keys, and four cursor control keys (laid out in a straight line, unfortunately). The keys are concave sculpted, and have a good feel, except for a slight "give" in the center of the keyboard.

Connectors are provided for a cassette recorder, external bus, RS-232 serial device, and modem. The modem is an option with the PC-5000 and fits into the lid of the case. It is a 300-baud, direct-connect unit with an auto-dial, redial, and conference phone capability. It is supported by the *SuperComm* software package by Sorcim.

Another optional extra which fits in the basic unit is an 80-column thermal printer which can print on plain paper as well as on thermal paper. It is a 30 cps unit that produces excellent type (and dot graphics) in a variety of formats.

Software is available on bubble memory cartridges or on disk. In addition to the built-in MS-DOS and Microsoft GW Basic, external software includes *SuperWriter*, an excellent menu-driven word processing package by Sorcim; *Super-Calc-2*, a spreadsheet package; and *SuperComm*. Many other software houses are said to be working to fit their packages on the PC-5000.

The PC-5000 is an outstanding, full-featured computer with a variety of excellent software backed up by some innovative serving arrangements. As such, it should find enthusiastic acceptance by a wide cross section of business people and other people on the move who need full-function computing power.

HP Portable

Hewlett Packard, one of America's first and strongest high technology corporations, has made an ambitious entry in the portable market with the HP Portable. Retailing for slightly under $3000, the Portable resides in an off-white box 13" wide by 10" deep by 3" high, weighing in at 9 lbs. 2 oz.

From that diminutive platform, the machine sports a CMOS (complementary metal oxide semiconductor) 8086 microprocessor. This is a true 16-bit CPU with a 16-bit data bus clocked at 5.33 MHz. It features 272K of non-volatile CMOS RAM and a whopping 384K of ROM. Its LCD displays is 80 characters by 16 lines in the text mode.

The HP Portable offers professional word processing capability with a standard-size QWERTY keyboard and a practical screen size. It has *Lotus 1-2-3* built into it, to combine spreadsheet, database, and business graphics capabilities in a single integrated package. A built-in clock/calender program keeps time to within two minutes per month and offers multiple alarm and appointment-keeping functions. The Portable also has a built-in modem and telecommunications software package that allows it to communicate with other micros, information networks, and databases, and to act as a dumb terminal.

Because these programs all reside in ROM, nearly all RAM is available for user applications. That means it is very likely that there is more room to run Lotus applications in the typical HP Portable than is left in many desktop computers after they have loaded the Lotus program. For example, it takes a minimum of 192K of RAM just run Lotus on the IBM PC. On a 256K PC, therefore, only 54K remains available for the user's own data.

Regarding the question of PC compatibility, the HP portable makes use of the MS-DOS 2.11 operating system from Microsoft. That makes reams of existing software, including many programs for the IBM PC, a distinctly compatible possibility.

Power is supplied by three semi-permanently installed, lead/acid D-cells. The power adapter supplied with the unit provides AC power to the Portable while recharging the cells. Battery life is approximately 16 hours of continuous use on a full charge.

Oh sure, we had some holdouts voting for the Gavilan and Grid Compass. There is no question that the Gavilan looks good on paper, but we worry when a company refuses to lend us a computer for in-depth testing. In the case of the Grid, a price tag in the $7000-8000 range doesn't make much sense considering that for the same money you can buy an HP Portable *plus* an outstanding desktop system *plus* a home system.

Desktop System —Under $2000

We expected the voting in the three desktop categories to be all over the ballpark. After all, there are more desktop computers than everything else put together, and one or more are available to meet the needs of practically anyone. Imagine our surprise then, when we tallied up the votes and came up with a clear winner in the under $2000 category. And imagine our added surprise upon finding the winner was an update of a computer first introduced in August 1977. Yes, the Apple II was introduced in 1977 (but in April, not August); our winner is the Radio Shack TRS-80 Model 4.

Actually, believe it or not, the Model III got just as many votes as the Model 4 (we "upgraded" the votes to the Model 4). At the current closeout prices of the Model III, noted several editors, nothing can touch it. However, at the closeout prices, the few remaining machines didn't last long. Anyway, the price of the Model 4 has been reduced to a real bargain level ($1299 with two disk drives).

We can attest to the durability of the Model III having used it for years for word processing and typesetting. The Model 4 is practically the same machine with several enhancements: faster processor, more memory, higher screen resolution, function keys, improved operating system, job control language, and prettier packaging.

The Apple II (e and c) was the runner up in this category. It had no major detractions—in fact, its color graphics run rings around the monochrome graphics of the Model 4—and is an excellent buy. The Morrow Micro Decision also received several votes; with similar capabilities to the Model 4 plus a stack of seven bundled software packages for just $1599, it, too, is an excellent buy. The new, improved IBM PCjr even had a supporter, but what the heck, if you are the editor of *PCjr* magazine, what else can you do?

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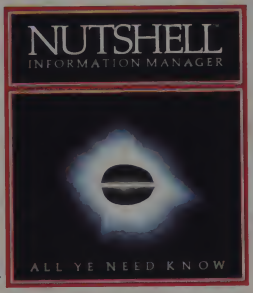

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CIRCLE 216 ON READER SERVICE CARD

Radio Shack TRS-80 Model 4

The TRS-80 Model 4 uses the venerable 8-bit Z80 mpu. While it is available with as little as 16K, we feel the system of choice is the 64K version with two disk drives. As with its predecessor, the Model III, the Model 4 has only limited graphics capabilities. It can, however, display 24 lines of 80 characters on its 12" monochrome screen.

The keyboard has 70 full-stroke keys divided into a standard alpha keyboard and a numeric keypad. Three function keys are at the top of the keypad. Instead of the battleship gray of previous TRS-80 computers, the Model 4 is housed in an attractive off-white cabinet.

The system is offered with two operating systems, TRSDOS 6.0 and CP/M Plus. It is also compatible with two other systems, TRSDOS 1.3 (for emulating a Model III) and LDOS (a popular third-party system). TRSDOS 6.0 is the latest generation system from Radio Shack and has many improvements over previous versions. In addition, TRSDOS 6.0 includes a Job Control Language which lets you construct a sequence of commands and statements to control the action of the operating system and/or application programs.

CP/M Plus is a secondary offering that runs on the machine but seems not to have the moral support of the folks in Fort Worth.

Model 4 Basic is the latest version of Microsoft Basic and is roughly equivalent to GW Basic on other machines (without the graphics commands).

Three manuals come with the Model 4, a 45-page introductory manual (good), Basic manual (fair), and a disk system owner's manual (rough going). Also included is a 38-page quick reference guide.

Interfacing to non-Radio Shack peripherals is a bit tricky, but Radio Shack offers practically everything you can imagine at very competitive prices.

A substantial amount of software is available for the Model III and 4 family, mostly from Radio Shack, and a few third-party vendors also support the computer. For common business applications such as word processing, spreadsheet calculations, and database management, the Model 4 is ideal. Furthermore, the Model 4 is a proven, reliable machine available in more than 8000 stores worldwide.

Desktop Systems —$2000 to $4000

Wow! Talk about muddy water! No fewer than six computers received first place votes in this category, and three more were mentioned as runners up. Moreover, they weren't even all IBM

The PC is the most copied and "improved upon" computer of all time, yet we chose it as the best mid-priced desktop.

clones as one might have expected—MS-DOS, CP/M, and several proprietary operating systems were represented.

Rising through the muddy water to emerge victorious was the—can you believe it?—IBM PC. The PC is the most copied and "improved upon" computer of all time, and it is not an innovative or state-of-the-art design, yet we chose the original PC as the best in this category. Why?

First, the PC was the original. Compatibility of the clones is always measured against the original; with the PC, there are no such questions. There are more peripherals and software packages for the PC than practically any computer in history. Support is ubiquitous. Resale value is good. And it *is* the standard. A configuration with 256K, two floppy disk drives, and monochrome monitor will cost in the neighborhood of $2300.

Ironically, neither of the two machines that tied for first runner up was a PC clone. They were: the Epson QX-10 and the Apple Macintosh. The Valdocs operating system on the QX-10 is one of the friendliest in the world—also one of the slowest. Had it not been for that, it probably would have received more votes. The new Valdocs 2.0 is said to be considerably faster; for Epson's sake, we hope it is.

The Apple Macintosh is state-of-the-art in black and white. A small footprint, fabulous graphics, $3\frac{1}{2}$" disk, mouse, but unfortunately, a paucity of software so far. Yes, we have all seen the Apple ads picturing many wonderful software packages for the Mac; the only trouble is, dealers don't have them—at least not yet.

Another non-IBM clone that attracted some attention was the ACT Apricot. The ACT Apricot family of seven machines is the first completely upward-compatible line of machines

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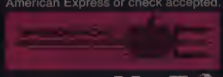

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CIRCLE 228 ON READER SERVICE CARD

IBM PC

Big Blue, the unqualified leader in mainframe computers, struck gold with the IBM Personal Computer. Despite an aging design, more powerful rivals, and a multitude of clones, the PC remains the standard by which all other microcomputers are judged.

The PC uses a 16-bit 8088 microprocessor, has 64K RAM expandable to 640K, includes Microsoft Basic in ROM, supports the 8087 numeric coprocessor, and contains five expansion slots. It comes with one or two double sided 360K floppy disk drives and can support a hard disk drive.

The 83-key detachable keyboard of the PC possesses marvelous tactile and aural feedback—even if it lacks a Selectric standard layout. The 10 function keys and separate numeric keypad, which doubles as the cursor control, have now become standards of the microcomputer world.

IBM built its name on quality products, and the PC is no exception. Reliability and durability are excellent, and most users experience few problems.

Finally, a bountiful supply of software packages and peripherals exists to fill your computing needs. If you can think of an application, chances are some manufacturer somewhere makes what you want.

With recent price cuts, the IBM PC has become a solid buy.

IBM PC AT

The IBM Personal Computer Advanced Technology improves upon the PC in the same way that the PC improved upon 8-bit machines. The heart of the AT is the 16-bit Intel 80286 microprocessor, which is a couple of generation more advanced than the 8088, yet fairly compatible. The AT uses a 16-bit external data bus interface, has Basic in ROM (64K expandable to 128K), holds up to 3Mb RAM, has eight expansion slots, and supports the 80287 numeric coprocessor. The 80286 operates at 6 Mhz, and combined with the 16-bit data paths, makes the AT two to three times faster than the PC.

The AT holds three disk drives, two half-height 5.25" floppy disk drives, and one full-height Winchester drive. IBM offers two kinds of floppy drives—a new double sided 1.2Mb high capacity drive, which comes standard on the AT, and a regular double sided 360K drive. The 1.2Mb drive is upward compatible, which means you can read from and write to 160/180K and 320/360K formatted disks (i.e., those used with the PC). If, however, you use a high capacity drive to write to these disks, that ranging from a low-end educational system to a 32-user local area network.

The top-ranked MS-DOS machine in this group was the TI Professional. Although the TI Pro has a relatively low level of compatibility with the IBM PC, it offers many significant advantages: improved color and graphics, faster performance, and better keyboard. Also receiving votes were several other IBM compatibles: Compaq, Columbia, Eagle, and NEC.

Desktop System —Price Is no Object

As in the previous category, Big Blue came out on top—this time with the newest machine in the stable, the PC AT. IBM need make no apologies about the AT; it is an innovative, state-of-the-art computer that has the competition gasping for breath. It is fast, expandable to 3Mb of RAM, has eight expansion slots, 1.2Mb high-capacity disk drives, optional 20Mb hard disk, excellent keyboard, and much more. The enhanced model—why get any other?—will set you back $5795 (with 512K, one floppy drive, 20Mb Winchester, and serial/parallel board, but no monitor). If you want a state-of-the-art machine at a top-of-the-line price, this is it.

First runner up in this category is the Apple Lisa 2/10. The big advantage of the Lisa over the Macintosh is its ability to load software on a hard disk. Also, Apple's new integrated software package for the Lisa is a beauty; people struggling with *Symphony* and *Framework* will really be envious of this. Apple has lowered the price of the Lisa systems; nevertheless, street prices are still in excess of $6000.

IBM need make no apologies about the AT; it is an innovative, state-of-the-art computer that has the competition gasping for breath.

Other systems receiving votes included the DEC Pro/380, AT&T 3B2, Dimension, and Compaq Deskpro.

Transportable —Under $2500

We had some interesting voting in both transportable categories and also some abstentions, accompanied by comments such as, "With the amount of

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America's #1 educational software program now has the elements of a traditional touch-typing course in addition to being the most entertaining way ever to learn to type. New Improved MasterType now includes a second diskette of finger positioning drills and games to increase your typing speed and accuracy.

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Availability:

New Improved MasterType:	Apple IIe/IIc,® IBM– PC/XT/PCjr,® Atari,® Commodore 64.® All with 2 disks, only 1 disk drive necessary. Macintosh disk. Atari and Commodore cartridges.
MasterType's Writing Wizard:	Apple IIe (128k)/IIc, Commodore 64. Both with 2 disks, only 1 disk drive necessary.
MasterType's Figures & Formulas:	Apple IIe/IIc, Commodore 64.

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information can be read only by a high capacity drive.

The touch and feel of the detachable AT keyboard are identical to those of the PC keyboard—good and solid with a comforting clicking sound. The layout is refreshingly standard Selectric and corrects most of the shortcomings for which users have criticized the PC keyboard.

One disappointment mars an otherwise dynamite machine: DOS 3.0, which comes with the AT, is not the multi-user, multi-tasking operating system for networking. On the bright side, networking hardware is already available, and full networking software support is due out during the first quarter of 1985.

Software compatibility is fair to good, with the AT running about half the packages available for the PC. Of course, once the software houses get their hands on an AT, conversions of PC programs will go from a trickle to a flood.

At $3995 for a base model (256K RAM, one 1.2Mb floppy drive, and no monitor) and $5795 for the enhanced model (512K RAM, one 1.2Mb floppy drive, one 20Mb Winchester, a serial/parallel board, and no monitor) the AT isn't cheap. But then again, price is no object. The IBM PC AT could be considered the Rolls Royce of desktop computers—a state-of-the-art machine at a top-of-line price.

Kaypro 2

Although more than two years old, the Kaypro 2 is as good a bargain today as the day it was introduced. Packaged in a no-nonsense rectangular sheet metal case, the machine has an 8-bit Z80 mpu, 64K of RAM, dual 5¼" 200K disk drives, and 9" green screen monitor. A detachable keyboard with 76 full-stroke keys and a 13-key numeric keypad clamps to the case for traveling. A parallel port and RS-232 serial port are also included.

The Kaypro normally runs CP/M and comes with applications software packages (word processing, spreadsheet, database manager, and spelling checker) as well as Basic.

The keyboard is arranged in a normal Selectric-type layout, and an LED indicates when CAPS LOCK is on. The coiled cable attaches to the back of the computer, a much neater arrangement than that offered by its (former) competitor, the Osborne. The screen displays 24 lines of 80 characters; several reviewers have commented on the excellent readability of the green-on-black

capability in notebook portables, I can't see the value in a transportable anymore," and "I can't stand these machines." As we looked into the situation further, we were confronted with the view that the main reason that the Os-

The main reason that the Osborne was a success was not that it was transportable, but that it came with a pile of bundled software.

borne was a success was not that it was transportable, but that it came with a pile of bundled software.

Today, a typical transportable takes up almost as much space on a desk as a desktop system. The screen size is generally smaller than a desktop system and, at a typical weight of 30 pounds, it really isn't very portable. So we have an in between category—neither fish nor fowl—that has a curious mixture of advantages and disadvantages.

Popping to the top in the lower price category is a machine that follows in the Osborne tradition of bundled software, the Kaypro 2. Its 9" monitor is two steps up from the original 5" monitor on the Osborne 01. A dual drive unit with an incredible array of software (MBasic, *WordStar*, *CalcStar*, *DataStar*, *SuperSort*, *MailMerge*, *Profit Plan* and *Multi-format*) goes for an astounding $1295.

It is too bad that Actrix is in Chapter 11, because the Actrix Computer tied for runner up. The Actrix has a built-in Epson printer and several other innovations. They took nearly a year to change their name from Access Matrix to Actrix and in the process lost critical momentum. Too bad.

The Compaq Portable tied with the Actrix, but the votes were based on some low street prices rather than on the list price ($2695). On the other hand, the Panasonic Sr. Partner and Seequa Chameleon each garnered a few votes and, when the Actrix and Compaq, are disqualified, they share second place.

Transportable —Over $2500

Despite a few abstentions, there was no question as to the winner here, the Compaq Plus. It was almost as though there were no other machines. In fact, there was little question as to the most

"MANAGING YOUR MONEY"™ alone is enough reason for many, many people to buy a computer."

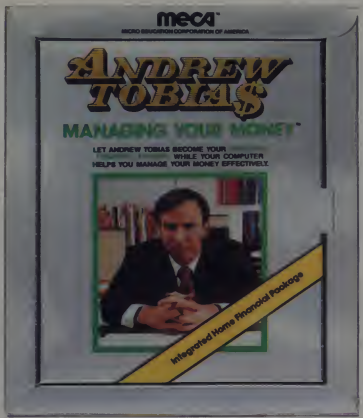
HENRY KISOR, CHICAGO SUN-TIMES, SEPTEMBER 9, 1984

"MANAGING YOUR MONEY is, simply, the finest personal financial management program on the market."

PERSONAL SOFTWARE MAGAZINE, JULY, 1984

"The first fully-integrated financial program that really makes a computer for the home worth the money."

SEYMOUR MERRIN COMPUTER WORKS OF CT



Disk version for IBM PC, XT, Compaq and now for PCjr with 256 K. Cartridge version available for PCjr at IBM authorized dealers.

"What the home computer market needs most is software good enough to make people use the machines they buy. A new program by Andrew Tobias may well be one for the money."

FORBES, APRIL 9, 1984

"It's a joy to use and deserves to be in every household that owns a personal computer."

COMPUTERS & ELECTRONICS, NOVEMBER, 1984

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It's seven programs in one. It prepares your budget and balances your checkbook. It calculates your net worth. It helps manage your stock portfolio. It calculates your taxes. It estimates your life insurance needs. It analyzes loans and helps you do retirement planning. It reminds you of important dates. No need for a big, bulky manual. With MANAGING YOUR MONEY™ all the help you need is constantly on-line, on the computer. And everything is integrated so you only need to enter data once.

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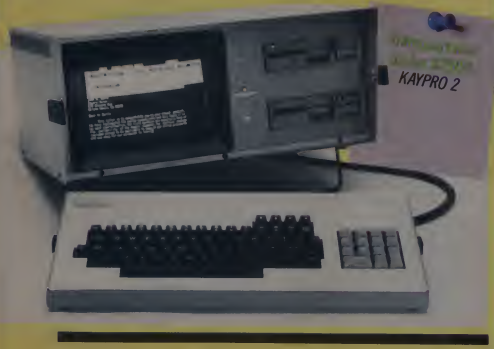
phosphor tube.

Minor annoyances. It interfaces only to a parallel printer; in the transporting position, the I/O ports and cables are exposed; and documentation, although adequate, could be improved.

Nevertheless, the Kaypro 2 is practical, functional, and economical. With its simple, elegant design, one might consider it the Honda of small computers.



Compaq Plus

The original Compaq was introduced in 1982, barely a year after the IBM PC itself. Although other "compatibles" had been introduced, the Compaq set a standard for PC compatibles that has seldom been matched.

The Compaq Plus is an extended version of the original Compaq. In the Plus, one floppy disk drive has been replaced with a 10Mb 3½" hard disk. Recognizing that transportables occasionally do get moved, Compaq has taken special care in mounting the hard disk. Miraculously, the Compaq Plus (at 26 pounds) is two pounds lighter than the original Compaq.

Other than the hard disk, the Compaq and Compaq Plus are practically identical. They both feature a 16-bit 8088 mpu, 128K (expandable to 256K on the motherboard or to 640K total), one parallel port, five expansion slots, 9" monochrome display (80 characters x 25 lines or 640 x 200 pixels), and detachable keyboard.

The system runs any version of MS-DOS or CP/M-86 but comes only with MS-DOS 2.1 and GW Basic. No applications software is included.

The Compaq Plus is 99% compatible with the IBM PC (Xenocopy does not run), but is a fine machine in its own right. It would have to be for Compaq to be the fastest growing company in the U.S. in 1983—and it was.

desirable configuration: 256K, 10Mb hard disk, and one floppy drive at a street price of around $5000.

The runner up is an interesting one. It is not even a computer normally thought of as a transportable, the Apple Macintosh. Want a description? Read on ahead.

Home Computer —Under $500

The overwhelming winner in this category was the Commodore 64. Everyone had comments (complaints) about it—slow disk drive, only two cursor directional keys, zero manufacturer support, non-standard interfaces, etc.—but still felt it was by far the best. For the price (generally under $200), you can't get another system with the same features: 64K, color, sprite graphics, and barrels of available software.

Even the new Commodore Plus 4 is not expected by our editors to be a real contender against the C64. Although it has built-in "integrated" software and good directional keys, it lacks the sprite graphics and will not run much of the software developed for the C64. Thus, we think it will be quite a while, if ever,

Everyone had comments and complaints about the Commodore 64 but we still felt it was by far the best. For the price you can't get another system with the same features.

before it catches up.

Runner up in the under $500 home computer category was the Radio Shack Color Computer. The machine uses the somewhat unfamiliar 6809 mpu, thus software has been a bit slow in coming. Of course, Radio Shack doesn't exactly encourage third-party developers either.

Several editors commented that the SpectraVideo 328 and 728 are really the machines of choice in this category; it's just too bad that SpectraVideo has experienced some rather severe financial problems.

Although Atari fans were discouraged by the recent turn of events in Sunnyvale, various Atari systems received votes in both home categories. At the current under $200 price, the 800XL is an excellent buy, but people said they would have a warmer feeling about

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Unlike other "Olympics-Like" games, Summer Games has incredible realism, superb state-of-the-art graphics and sound effects (including national anthems from 18 countries), and it is a true action-strategy game. In each event you must plan and execute your game strategy in order to maximize your score. It is not just a matter of how fast you can move the joystick.

So change into your running shoes, grab your joystick and **GO FOR THE GOLD!**

One or more players; joystick controlled.

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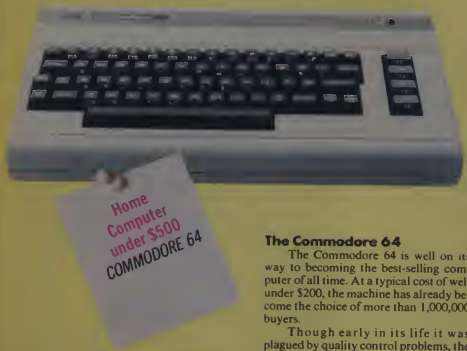

The Commodore 64

The Commodore 64 is well on its way to becoming the best-selling computer of all time. At a typical cost of well under $200, the machine has already become the choice of more than 1,000,000 buyers.

Though early in its life it was plagued by quality control problems, the C64 has earned its place in the ranks of graphics and sound machines. It can compete with the best of them, offering 300 x 192 pixel resolution in 16 colors and sound comparable to that of dedicated synthesizers. As a result some of the best entertainment packages available today run on the C64. That is not to imply that the C64 cannot get down to business—over 100 of the most popular word processing, spreadsheet, database, and telecommunications programs are available for it.

The basic C64 comes with 64K and a 40-column display. However those capacities can be increased to 80 columns and unlimited bank-switched RAM through the addition of add-on boards. In that manner the C64 can be made into quite a serious machine.

The C64 now has an excellent library of software and is sure to be well-supported for years to come.

The C64 disk drive is very slow and has also been subject to quality control problems. However it remains among the least expensive disk drives available for any personal computer. That, combined with reasonable printer and monitor prices, make a complete C64 system available for less than the price of the system unit of many competitors.

Apple IIc

Apple introduced the IIc in an enormous celebration in San Francisco, "Apple II Forever." The machine has been well received by consumers, and there is no question that the IIc will play an important role in extending the life of the Apple II family.

The IIc is a portable version of the Apple IIe, and at 12" x 11.5" x 2.5", it is truly portable. Built inside is a 65C02 processor, 128K, a 140K disk drive, and a 40/80-column display standard (the equivalent of a IIe with an Extended 80-Column Card installed in slot 3). Also featured is 16K of ROM including Applesoft Basic, a system monitor, and diagnostics firmware.

Our original review of the Apple IIc called it "the home computer of the Pepsi generation." It has been designed for maximum ease of use and maximum utility in the least possible space. The recent release of a full-screen LCD display for it has further increased its portability.

Unfortunately, some of the small size, convenience, and good looks of the IIc were exchanged for capability. The Apple IIc sports two serial ports, a drive port, and that's it. There is no expansion bus and no parallel interface.

Now expansion peripherals for the IIc that daisychain from the serial port are being produced. The keyboard of the machine is attractive, but does not offer quite the travel of the typical full-stroke keyboard. And the system is limited to a maximum of two disk drives.

Still, the IIc remains an extremely attractive system and is sure to remain among Apple's best sellers for quite some time to come.

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BECAUSE AUTO RACING IS NOT A SOLO SPORT.

When we introduced Pitstop, we created action in the pits. Now, with PITSTOP II, EPYX introduces true competitive auto racing, both on the track and in the pits. Auto racing is not a one man sport. With PITSTOP II, you can now experience the thrill of speed and competition as you battle your opponent in a race against the clock. Now, more than ever, the strategy of when you make a pit stop and your pit crew's speed and performance, combined with your skill on the track, will determine the winner.

A split screen shows you your position and that of your opponent, a digital clock displays time and a lap counter gives you your race position as you race against each other in pursuit of the checkered flag. You can also play against the computer or take a few practice laps as you prepare for the real head-to-head competition. Step up to PITSTOP II because auto racing is not a solo sport.

One or two players: joystick controlled; disk or cassette.

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The TRS-80 Color Computer

Today's TRS-80 Color Computer 2 has changed very little since the original Color Computer was introduced in August 1980. Fully upgraded, the Color Computer has 64K RAM and a 16K ROM with Microsoft Extended Color Basic. The basic unit has 16K RAM with an 8K ROM containing Microsoft Color Basic. The Color Computer CPU is the 8-bit Motorola 6809E.

The Color Computer operating system addresses a ROM port on the side of the computer used for plug-in ROM cartridges called Program Paks. Other ports standard on the Color Computer are a Serial I/O port used for modem and printer connections, a TV video output (not video monitor compatible), left and right joystick ports, and a cassette port. Although Radio Shack has discontinued its use of the Chiclet keyboard, it has not yet offered a Color Computer with a keyboard comfortable for long use.

The Color Computer Disk Operating System includes, Color Disk (Microsoft) Basic, which enhances Extended Color Basic for disk use. It is plugged into the ROM port and can support up to four single sided, double density disk drives. Color DOS is simple to use and understand. What it lacks in complexity of structure, it makes up for in ease of use for the novice.

OS-9 and Basic-09 are available and offer a much higher level of sophistication for advanced users.

The Color Computer 2, introduced in September 1983, is 100% compatible with the former model. Tandy engineers fine tuned and compressed their original design into a single-board package that reduced the size of the machine by one-third. The design was simplified to the point that even the least nimble fingered user can easily modify the machine to personal specifications. The most popular re-configuration of the machine is to add a composite video output port and a full-stroke keyboard.

recommending the machine if they were sure the company would be around two years from now.

Oh yes, one editor voted for the TI 99/4A, commenting that you could buy five of them for the price of a C64. But who needs five home computers?

Home Computer —Over $500

In the voting for this category, the old, familiar question came to the fore, "What are you going to do with it?" Those people who considered a home system an extension of the one at the office leaned toward a duplicate (or

> **In considering home computers, the old, familiar question comes to the fore, "What are you going to do with it?"**

compatible) of whatever they had at the office. People with young kids wanted a machine to run educational software, while those with older children leaned toward a machine with word processing capabilities.

Despite these sometimes conflicting requirements, the winner turned out quite clearly to be the Apple II. Perhaps we said "quite clearly" too soon since the Apple II votes were split nearly in half for the IIe and IIc. The IIe got one more vote than the IIc, but either one is a good choice. The IIe, because of its ability to accept plug in boards, will have greater appeal for the experimenter. The IIc is designed for use as is. We would probably lean to a IIe for color graphics, educational applications, and games, while the IIc would get our nod for word processing and business related applications. An Apple IIe with 80-column card and monochrome monitor runs around $1000; a IIc goes for $1200 or so.

First runner up was the IBM PCjr—new, enhanced version only—for its ability to run IBM PC applications at home. Although there are some nice home and educational software packages for the PCjr, we think that if those are your primary reasons for buying a system, the Apple is a better bet. Be sure to check out the application you want to run on the PCjr; we understand that some of the applications that are supposed to run don't seem to.

The Apple Macintosh garnered a few votes in this category and there was one lone vote for the Coleco Adam. De-

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Why do typing programs have to involve shooting down spaceships? They don't!

9 TO 5 TYPING lets students and adults learn to type using an effective method developed by college educators. We've taken the ten basic steps to learning typing and combined them with the fun of sequences from the movie, 9 TO 5.* What could be better than learning the key locations while helping Doralee lasso Hart. Or increasing your speed while taking pot shots at Hart in a shooting gallery. All the fun of the movie combined with an innovative new approach to learning touch typing.

9 TO 5 TYPING. The typing game for everyone...Spaceships not included.

EPYX
COMPUTER SOFTWARE

Strategy Games for the Action-Game Player

*9 TO 5 is a trademark of Twentieth Century-Fox Film Corp.

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spite offering excellent price/performance, we do not have warm feelings about Coleco's marketing approach for the Adam: mass merchandisers, TV promotion, promise 'em anything. It takes a different approach to market computers than to hawk Cabbage Patch dolls and big wheels.

Educational System —Under $1000

No wonder educators are having so much trouble figuring out which computers to get. The choice is not at all clear; furthermore, manufacturers are offering educational discounts, multi-unit purchase contracts, free software, and all kinds of deals to muddy the water. In our voting, we stuck to the list prices and tried to skirt the special deal quagmire.

Incidentally, we feel that an educational system must have a disk drive and monitor (or TV set), preferably color. Hence, we are including these elements in the system price. As a result, many computers for which the basic machine price is under $1000 wound up in the over $1000 category.

Even so, we had problems. Edging into first place by a hair was the Radio Shack Color Computer. While not as much educational software exists for the Color Computer as for the Commodore 64, it is generally of better quality. Furthermore, Radio Shack has a substantial corporate commitment to support the education market compared to virtually none at Commodore.

Not many other systems are priced under $1000 (list price) complete with disk drive and display. The Atari 600XL and 800XL got a few votes, but the same comments apply here—even more so—as in the home market.

We feel that an educational system must have a disk drive and monitor. As a result, many less expensive computers wound up in the over $1000 category.

Educational System —Over $1000

In this category, we had three major contenders and three lesser contenders. All six have a great deal to offer to educators, and, depending upon the circumstances, any one of the six could be the "right" choice. However, in our poll, one system emerged as the winner, the Apple IIe.

Apple has had a major commitment to the education market almost since the founding of the company. Moreover, the "open architecture" of the Apple family of machines has attracted many peripheral manufacturers and software publishers to produce educational applications for it. As a result, there is a tremendous body of interesting and innovative educational material available for the Apple ranging from real-time science experiments to special keyboards for preschoolers. In our minds, there is no question about which Apple to choose; for schools, the IIe offers greater flexibility and a lower price. Coupled with one or two disk drives, an 80-column board (not vital), and a color

The computer monitor so ingenious,
If you're torn between buying a dedicated monitor and making do with your regular TV, there's a smarter alternative. The General Electric Monitor/TV.
First and foremost, it's a computer monitor.
Compatible with all major computer brands, it combines these advanced features to sharpen text and graphics and deliver a display that's easy-on-the-eyes Direct and split video inputs, 320-line resolution via a comb filter: plus a computer grade, 5mm-pitch Neovision™ picture system
For the name of your nearest dealer call The GE Answer Center™ information Service, 1-800-626-2000

monitor, it is the configuration of choice.

The two other major contenders were the IBM PC (and new PCjr) and the Radio Shack Model 4. Both companies are committed to the education market and provide appropriate handholding. Close behind was the Acorn BBC computer, far and away the number one educational system in England, but one which has had a rough time getting off the ground in the U.S.

Another British entry in this race was the Memotech, an innovative, capable machine, but one with spotty support in the U.S. And we can't overlook the Apple Macintosh which is coming on strong in the college market. As more software becomes available, it should be a major contender at lower educational levels and in the home.

All-Around System —Any price

With 13 people each casting a vote for a winner and runner up, you would think there would be a clear overall winner. Not so. Not only is there no clear winner, but there is no winner at all. All told, 12 computers were mentioned, and no single one got more than two first

With 13 people each casting a vote, you would think there would be a clear winner. Not so.

place votes. As we said at the outset, choosing a personal computer is a very personal thing.

Here are the 12 systems—in alphabetical order—that were mentioned:

- Apple Lisa 2/10
- Apple Macintosh
- Apple IIe
- Amiga Lorraine
- AT&T 3B2
- DEC Pro/380 with IBM emulation
- Dimension
- Gavilan with video display
- IBM PC AT
- IBM PC XT
- IBM PC 3270 with hard disk
- Mindset

Rather than make an award based on one or two votes, we think the sensible thing to do is to simply let you make up your own mind. Any one of these systems—and probably a dozen others —would make a fine choice although, as always, it is vital for you to define your application(s) first, then choose the software, and finally, the hardware.

Although there was no single best all-around system, we noted that one system stood out because it was mentioned in so many categories. Although many systems were mentioned in two categories, just two systems were mentioned in three categories, and only one in four categories—the Apple Macintosh. It received votes in the desktop, transportable, educational, and home categories. That may not make it the best all-around system, but it certainly is worthy of mention and at least a silver medal.

So there you have it, the 12 best computers on the market today. Stay tuned to *Creative Computing* for our continuing reviews of the latest systems and, next December, for our annual 12 best awards. ■

it even runs this kind of program.
Secondly, it's a first class TV.
Flick a switch and these same advanced electronics give you an outstanding TV, with a high-contrast picture and rich, true colors. And you get all this for about the same price as an ordinary monitor. Another piece of ingenuity we thought you'd appreciate.
We bring good things to life.
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Simulated Monitor/TV Picture

The Apple IIe

The Apple IIe was the first Apple machine to sport a full-function, Selectric-style keyboard, and was the successor to the successful and ubiquitous Apple II and II+ models.

Though it comes in the same size and style case as its predecessors, the Apple IIe has been improved in many more ways than just its keyboard. It has a massively reduced chip count (31 as opposed to 110 in the original Apple II), and therefore generates less heat during operation. It features 64K and a lowercase character set standard. It accepts a low-cost 80-column card.

Two LSI chips in the Apple IIe replace approximately 80 chips in the old Apple II. One of them, called the MMU, can generate a multicolor graphics mode that has come to be called "double density hi-res." This mode has a resolution of 560 x 192.

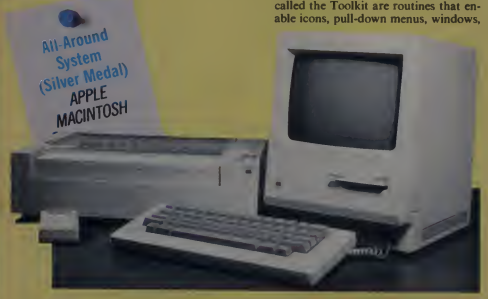
If it is expandability you desire of an Apple computer, the Apple IIe is the one to choose—certainly over the Apple IIc which has markedly limited expansion capabilities. The IIe includes five internal expansion slots.

While it remains highly compatible with the original Apple series, the Apple IIe is a wholly different machine, and many packages designed for the Apple II will not run correctly on the IIe. However, all new packages will run on the IIe, which is now the low-end flagship of Apple Computers.

Apple Macintosh

The introduction of Macintosh heralded a true breakthrough in consumer microcomputing. For compact design, ease of use, and price/performance, the Mac is a pacesetter.

Built around a 68000 microprocessor, the Macintosh is the first computer to embody not only a hardware but a software philosophy in its design. Present in a part of its 64K ROM called the Toolkit are routines that enable icons, pull-down menus, windows, and the mouse, which act together as the smoothest user interface available for any consumer machine.



The Macintosh philosophy is to make software that functions as "intuitively" as possible. It also ensures that different software packages will function in the same manner, so commands and functions learned for one package will carry over to others.

The Mac is not without its problems, however. It ships with 128K RAM standard, which is skimpy for the kind of overhead the Toolkit and disk operating system require when combined with actual application demands. Upgrading to 512K will be costly and require a trip to the service center. The system can be intolerably slow at times, and Mac suffers as does the IIc from the lack of easy expandability. Software for the machine has been slow in coming, and many packages will probably be delayed until the 512K Mac makes its appearance.

Still, the current problems of the Mac do not in any way negate its impact on the market. It has set a standard for ease of use that is likely to prevail over time.

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You can count on BASF FlexyDisks because the Qualimetric standard reflects a continuing BASF commitment to perfection in magnetic media. One example is the unique two-piece liner in our FlexyDisk jacket. This BASF feature traps damaging debris away from the disk's surface and creates extra space in the head access area for optimum media-head alignment. The result is a guaranteed lifetime of outstanding performance.

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RUSS LOCKWOOD

State of the art technology enhances the PC

IBM PC AT

The IBM PC is one of the biggest success stories of the microcomputer industry. Within three years, it has come to dominate the industry, making the 8088 microprocessor and MS-DOS operating system de facto standards and PC compatibles all the rage. Even as its architecture aged and faster, more powerful machines entered the marketplace, the PC rode IBM quality and recognition into the sales record books.

What could IBM do for an encore? We mean a real encore, not just rebundling the system as an XT, jr, or portable. Something that would improve upon the PC in the way that the PC improved upon 8-bit machines.

Well, the folks at IBM have done it again, and in a big way. The press releases call the new machine the IBM Personal Computer AT. We call it dynamite.

AT: Something to Phone Home About

Contrary to wishful thinking, the AT acronym does not stand for Alien Traveller. It does stand for Advanced Technology, which is bland but certainly descriptive. IBM has created a state-of-the-art microcomputer—at a top-of-the-line price.

Like the PC, the AT consists of three components: a display, a detachable keyboard, and a system unit housing the cpu, disk drives, and all the electronic innards of the system.

System Unit

The heart of the AT is the 16-bit Intel 80286 microprocessor, which is a couple of leaps ahead of the 8088, yet fairly compatible. The AT uses a 16-bit external data bus interface, has Basic in ROM (64K expandable to 128K), and can hold up to 3Mb of RAM. The 80286 operates at 6 Mhz, and combined with the 16-bit data paths, makes the AT two to three times faster than the PC.

Table 1.

	Time	Accuracy	Random
IBM PC	24 seconds	0.1159668	6.3
IBM PC AT	9 seconds	0.1159668	9.3

For example, compare the results of Ahl's Simple Benchmark Test for the PC and the AT in Table 1. At nine seconds versus 24 seconds, the test bears out IBM's speed claims.

The AT motherboard normally holds 256K RAM, but you can use special piggybacked 64K chips to increase capacity to 512K RAM. This method of

CIRCLE 230 ON READER SERVICE CARD →

IT'S HERE

COL

INTRODUCING OKIMATE 10... THE FIRST

The printer in a class by itself.

It's here! The new OKIMATE 10 Personal Color Printer. The first color printer that lets you show off and tell all. The printer that lets you print all the information you can create with your Atari® or Commodore® computer. But with the remarkable ability to create original drawings and graphics as well, in over 26 beautiful colors.

A class act! The OKIMATE 10 gives you crisp, clean term papers, school reports and homework. Word processing capability means everything you do can be printed letter quality in minutes, instead of typed in hours. OKIMATE 10 color gives you the opportunity to print graphs, charts and pictures from popular graphics and drawing programs. OKIMATE 10's brilliant color means you'll shine, every time.

OKIMATE 10 feels right at home. Anywhere.

A special PLUG 'N PRINT™ package lets you plug your new OKIMATE 10 into your Atari or Commodore computer. And print. It's that easy. In minutes you'll be printing everything from soufflé recipes to needlepoint patterns. Party invitations to kitchen inventory. Love letters to gardening directions. At 240 remarkable words per minute. And not just in black and white, but in over 26 brilliant colors!

Financial statements will keep you tickled pink for very little green.

If you use your personal computer to keep track of mortgage payments, tuition payments, balance your checkbook or jump ahead of the Dow Jones', there's good news for you. You'll find that the new OKIMATE 10 gets down to business quickly. And easily.

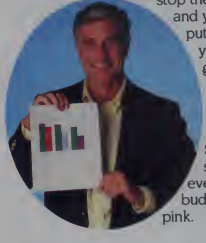
A "Learn-to-Print" diskette and tape shows you how to set up your new personal color printer and start printing. A complete OKIMATE 10 Handbook will show you how you can take your imagination to places it's never been before.

*Atari is a registered trademark of Atari Inc. *Commodore is a registered trademark of Commodore Business Machines, Inc.

LOR

PERSONAL COLOR PRINTER UNDER $250.

And while your imagination is soaring, you'll be glad to know that your new printer can keep right up with it! The new OKIMATE 10 is built with the same tradition of quality and manufacturing excellence that has made Okidata the most respected name in computer printers. Okidata craftsmen specially designed and engineered the new OKIMATE 10 to be incredibly small and lightweight. And they made it quiet as a whisper. But their imagination didn't stop there. To help you and your personal computer keep within your personal budget, they made the OKIMATE 10 available at retailers everywhere for less than $250. Something that should make every personal budget tickled pink.



Color your world.

If you've been playing games on your personal computer, now you can get serious and still have fun. The new OKIMATE 10 is completely compatible with a variety of software packages that will run on your Atari and Commodore with a simple disk drive. Just load and you're off and running. Plotting charts. Designing special graphs. Creating original illustrations and pictures. Drawing special graphics. And printing them all beautifully for everyone. On most kinds of paper. In over 26 beautiful colors!

QUESTIONS & ANSWERS

Q: Why do I need a printer?

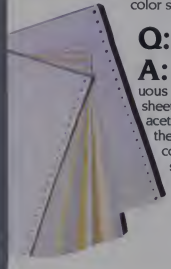
A: You might as well ask, "Why do I need crayons?" When it comes to communicating, "putting it on paper" is still the best way to get your message across. You can have lots of computer equipment, but without the OKIMATE 10, it doesn't mean very much. Unless you get your letter, report, term paper or party invitation off the screen and down on paper, nobody's going to see it.

Q: What makes the OKIMATE 10 better than any other printer?

A: Because the OKIMATE 10 is unlike any other printer. First, it prints in COLOR. Up to 26 beautiful colors. Second, it prints up to 240 words a minute, so quietly you can talk in a whisper right next to it and still hear every word! And third, it prints letter quality, every time.

Q: What about graphics and pictures?

A: The OKIMATE 10 does it all. Graphs, charts, symbols, pictures, illustrations, and special drawings! With a compatible drawing package, anything you create on your screen can be printed in full color; a disk drive is required for color screen printing.



Q: What kind of paper can I use?

A: Just about any kind of smooth paper you want. From continuous feed computer paper to single sheets. From mailing labels to plastic acetate for overhead transparencies, the OKIMATE 10 prints crisp, clean, colorful images you'll be proud to send to friends, teachers, business associates, or frame and hang right in your own living room!

Q: Is the OKIMATE 10 easy to use?

A: As easy as "PLUG 'N PRINT!" No other printer is easier to use than the OKIMATE 10. Connecting the printer to your Commodore or Atari computer is, literally, a snap. The exclusive PLUG 'N PRINT package snaps into the printer. One cable connects it directly to your computer or disk/tape drive. Turn it on and you're in business. Once your OKIMATE 10 is up and running, the "Learn-to-Print" software program (included) teaches you printer basics—the "Color Screen Print" disk (also included) automatically prints everything on the screen in a single stroke. As a matter of fact, most of your printing can be done with just one command.

Q: What's the printer like in operation?

A: In one word: easy! Incredibly easy! The ribbon comes in a "Clean Hands" cartridge. So it's as easy to change as the tape in your audio cassette player.

Q: What about reliability?

A: Okidata has built the reputation of its complete line of printers on quality, dependability and rugged construction. The OKIMATE 10 is no exception. Don't let its light weight and compact size fool you. This printer is not a toy. It's a workhorse.

OKIDATA
an OKI AMERICA company

Available at retailers everywhere.

placing more RAM on the motherboard seems like an interim solution to the shortage of 256K chips. IBM notes that 64K chips cost less than 256K chips.

Whatever the reason for the piggybacked 64K chips, give IBM three cheers for eliminating most of the DIP switches on the motherboard. The AT uses a short installation program in CMOS RAM to set up a particular hardware configuration. This CMOS RAM also contains a clock/calendar. A removable GE lithium battery attaches to the rear wall of the system unit by a velcro strip, so changing the battery is quick and easy. The one switch left on the motherboard determines whether you use a color or monochrome monitor.

Adding Things

For fast number crunching, the AT supports the 80287 numeric co-processor, an advanced version of the 8087 you can place in the PC.

The AT has eight expansion slots, two with the 62-pin card edge socket (8-bit) found in the PC and six with dual 62-pin and 32-pin sockets (16-bit). What this means is that expansion boards for the PC may not fit in the AT. It all depends whether the boards have a "skirt" that hangs lower than the connector. If a skirt is present, as on the IBM graphics board, you must place it in one of the two expansion slots with only the 62-pin socket. If the board has no skirt, you can fit it in any of the eight slots.

IBM offers two RAM expansion boards for the AT. One holds 128K and is used to bring the computer up to 640K, which is the limit addressable by DOS 2.0 and 2.1. The other holds 512K and is used only in conjunction with the Xenix operating system, Microsoft's version of Unix.

IBM plans to sell a Prototype Adapter, which is a blank circuit board, for third party development.

Fire Up the Converters

The AT uses a 115/230 volt "worldwide" power supply that you can switch between 60 MHz and 50 MHz. Thus, if you take the AT to a foreign country, you do not need to purchase a power adapter. You must, however, buy a specific cable for the specific country in which you plan to use it.

To keep cool, the AT uses a variable speed fan. The hotter the AT gets, the faster the fan goes. This design also reduces the noise of the fan, making for a generally quieter work area.

Ever security conscious, the AT has a keylock to prevent unauthorized access to the machine. The lock performs three functions: it locks the cover on the machine so no one can open the system unit; it prevents entering information from the keyboard; and it prevents rebooting of the computer.

Furthermore, you can lock up the computer while it runs a program, which ensures that no one will accidentally stop or alter your program if you step away from your desk. While this will not stop a thief from carrying the entire computer away, it will stop those who simply want to play with the system.

You can place the system unit on a desk or use a floor stand to stand it upright on the floor. The AT has a rotating nameplate. Thus, whether on the floor or on the desk, you can be sure that the IBM logo will be right side up. Those guys think of everything.

Megadisk Drive

The system unit holds three disk drives, two half-height 5.25" floppy disk drives, and one full-height Winchester drive.

IBM offers two kinds of floppy drives. The first is the new 1.2Mb double sided high capacity drive, which comes standard on the AT. We could not figure out who manufactured it, but it is made in Japan. It is upward compatible, which means you can read from and write to 160/180K and 320/360K formatted disks (i.e. those used with the PC). However, if you use a high capacity drive to write to these disks, that information can only be read by a high capacity drive.

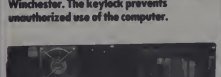
Anticipating the problem of swapping disks between an AT and PC, IBM also sells a double sided 360K capacity floppy drive, distinguished by an asterisk on the front. Both drives are very easy to install, and the drive controller and power supply connectors fit together only one way.

Both drives use sturdy rotating knobs rather than flip-up doors and contain a locking mechanism to hold the disk in. When you push the disk in, the drive locks it into place. You rotate the knob down to secure it, and when you ro-

HARDWARE PROFILE

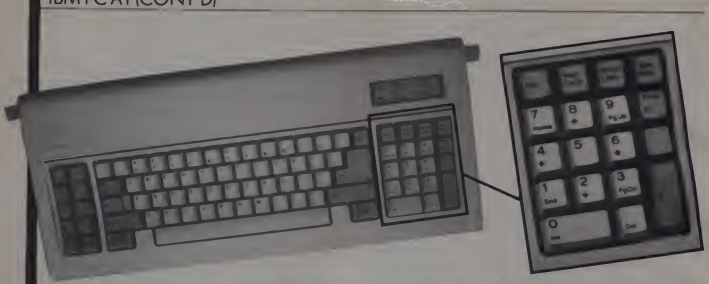
Name: IBM PC AT **Type:** Desktop **CPU:** 16-bit 80286 6 Mhz **RAM:** 256K (expandable to 3Mb) **ROM:** 64K (expandable to 128K) **Keyboard:** Detachable, 84 keys, slant adjustable **Display:** 25 x 80 characters, 320 x 200 pixels **Disk Drives:** One or two 1.2Mb floppy disk drives and 20Mb Winchester. **Documentation:** Three loose leaf manuals **Operating System:** PC-DOS 3.0 **Dimensions:** System unit: 21.3" x 17.3" x 6.4" Keyboard: 18.4" x 8.3" x 1.5" **Summary:** State of the art machine at a top of the line price. **Price:** Base unit with 256K RAM, one 1.2Mb floppy disk drive, $3995.
Manufacturer: IBM
Entry Systems Div.
P.O. Box 1328
Boca Raton, FL 33432
(305) 998-2000

The front panel of the AT hides the 20Mb Winchester. The keylock prevents unauthorized use of the computer.



The rear panel of the AT. Note the eight expansion slots.

The AT exposed, with a 1.2Mb floppy disk drive, 20Mb hard disk drive, 640K RAM, color graphics board, and 80286 microprocessor.



The IBM PC AT keyboard corrects most of the deficiencies of the original PC keyboard. Note the true Selectric layout, LEDs, and larger Return and Shift keys.

The numeric keypad includes a System Request key for use in programming.

tate the knob up, the disk pops out.

Actually, the AT looks as if you could install a third half-height drive, although it would have to be a Winchester drive because the system unit cover blocks access to it. The disk drive controller board, which controls floppy and hard drives, has four connectors.

An optional 20Mb Winchester fits next to the floppy drives, providing more than enough storage for most users.

AT Last, A Standard Keyboard

Ironically, IBM, designer of the standard Selectric typewriter keyboard, has been plagued by problems with its microcomputer keyboards. We have documented the fortes and foibles of the PC keyboard and blasted the old PCjr "Chiclet" keyboard. With the AT keyboard, we are fast running out of nits to pick.

The touch and feel of the AT keyboard is identical to that of the PC keyboard—good and solid with a comforting clicking sound. The layout is refreshingly standard, which is a boon to touch typists. The misplaced backslash key is banished to a spot above the Return key, which is now labeled Enter. This Enter key is located above the right hand Shift key, displacing the infuriating tilde key.

The Shift keys are larger and the Enter key is much larger than their counterparts on the PC keyboard. After all this time, IBM has finally labeled them in English, although the arrows are kept as well. The spacebar is separated from the Alternate and Caps Lock keys.

Green LED lights, indicating that the Caps Lock, Num Lock, and Scroll Lock keys are toggled on, are located above the numeric keypad. The numeric keypad, which still does double duty for cursor control, has its own Enter key. The Escape and Print Screen keys have been moved to the numeric keypad and IBM has added a System Request key as well. This key is used for programming and allows you to run applications concurrently.

Perfect, right? Well, almost. To make room for the backslash key, IBM shrank the Backspace key. If you use this key often, you are likely to end up pressing the backslash key. And there are still no raised bumps on the J, D, and 5 keys. Finally, English labels are still missing from the Backspace and Tab keys. That's all folks. IBM has manufactured a magnificent keyboard.

Better yet, the AT keyboard can be configured in different languages, including French, Italian, and German.

One last plus for the detachable keyboard. It is connected to the system unit with a nine-foot long coiled cord, offering a great deal of maneuverability and convenience.

AT Display

IBM has beefed up its color graphics for the AT. You can choose from three different sets of monitors and graphics boards: the standard Color Display and Graphics Adapter (four colors from a 16-color palette) that first came out with the PC; the Enhanced Color Display and Enhanced Graphics Adapter (16 colors from a 64-color palette); and the Professional Graphics Display and Professional Graphics Controller (256 colors from a 4096-color palette). The Enhanced Graphics Adapter also supports graphics on the IBM Monochrome Display, and IBM sells a Graphics Development Toolkit to assist programmers in designing graphics applications.

Operating System Upgrade

First, the good news: The AT comes with a new version of PC-DOS. Now the bad news: It is not the multi-user, multitasking operating system we were expecting.

DOS 3.0 is an enhancement of DOS 2.1 and contains a few new commands, including:

Attrib: Marks a file as read-only, protecting files from revision or erasure. It can be removed.

Country: Includes a country in the date and time format.

Device: Allows you to set up RAM disks.

Fcbs: Opens a designated number of file control blocks for concurrent use.

Label: Lets you add, delete, or change the volume label on the disk.

Lastdrive: Sets the maximum number of disk drives you can access.

Select: Lets you choose a foreign keyboard layout.

Share: Brings you to the fringes of networking with file sharing, but these "hooks" are not single-user, multitasking options.

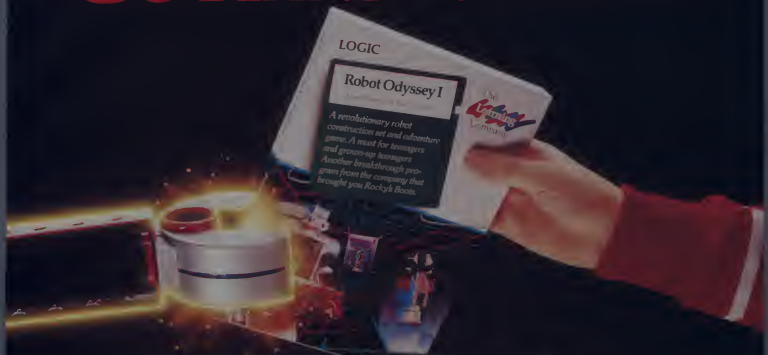
Other enhancements include support for the high capacity drives.

Xenix Gets a Big Boost

The AT will run Xenix, Microsoft's version of the Unix Time Sharing System. Xenix allows both single-user and multi-user configurations and lets you run several programs at once. It just happens to support memory up to 3Mb, which is what the AT holds.

However, you will have to wait a bit

LEARNING & FUN GO HAND 'N' HAND


LOGIC
Robot Odyssey I
A revolutionary robot construction set and adventure game. A must for teenagers and grown-up teenagers. Another breakthrough program from the company that brought you Rocky's Boots.

From the Producers of Rocky's Boots™

Robot Odyssey I™

A Revolutionary New Educational Software Program for Teenagers and Young Adults.

Fall into the underground world of Robotropolis and see if *you* can find the way back to civilization. Build maze-blazing robots! Trek through five mini-games! And become an original game designer!

Finally, an educational software program that's both an adventure game and robot construction set. Learn how to design integrated circuits, burn chips and program robots.

And "they" said it couldn't be done.

So take on the challenge. Stop by your local dealer and see Robot Odyssey I for yourself. It's the game of the decade.

Enter the Robot Odyssey I Sweepstakes!

2 Grand Prizes: Androbot® Topo® Robots.

10 Runner-Up Prizes: Androbots *New* F.R.E.D. Robot.

To enter, send your name and address along with the phrase "Robot Odyssey I Sweepstakes," to The Learning Company (address below). All entrants receive a free color poster.

Entries must be received by [illegible]. One entry cannot be used in connection with any other. Void where prohibited. [illegible] restrictions. Drawing to be held [illegible]. Winners to be notified by [illegible]. For a list of winners, send a self-addressed, stamped envelope to The Learning Company, [illegible]. Androbot® is a registered trademark of Androbot Inc. Topo® is a registered trademark of Androbot Inc. F.R.E.D. is a trademark of Androbot Inc. [illegible] is a trademark of [illegible]. Apple® is a registered trademark of Apple Computer, Inc. Atari® is a registered trademark of Atari, Inc. Commodore 64™ is a trademark of Commodore Electronics, Ltd. IBM® is a registered trademark of International Business Machines Corporation. TRS-80® is a registered trademark of Tandy Corporation. [illegible] is a trademark of [illegible].

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to buy Xenix and other networking options. IBM plans to release Xenix, a network program, an SNA 3270 emulation program, and a multi-tasking windowing program called *Topview* in the first quarter of 1985.

Networking Hardware Ready

As usual, software development lags behind hardware. IBM already sells the networking hardware. We did not have the hardware installed on our machine and could not make any determination on how easy or hard it is to install and operate. We can give you an overview of what IBM offers.

Network Adapter: An expansion card links the AT, PC, XT, and Portable PC to the PC network. One adapter is needed for each computer. The adapter does not work with the PCjr.

Network Translator: A stand-alone unit supports up to eight stations without additional components, up to 72 stations within a 1000-foot radius with IBM networking cabling, and up to 255 stations within 1000-foot radius with custom cabling (not offered by IBM).

Network Base Expander: Increases the capacity of the translator from a maximum of eight stations to a maximum of 72 stations.

Network Kits: Increases the maximum distance between translator and stations. Short up to 200 feet, Medium up to 600 feet, and Long up to 1000 feet.

Software Compatibility

For the AT to become a complete success, it must be able to run much of the software available for the PC. IBM has released a list of programs that run on the AT. These include Peachtree accounting programs, Dow Jones Reporter, *Multiplan*, *VisiCalc*, *Easywriter*, and 56 others. So far so good. But IBM has also released the names of 11 programs that do not work on the AT.

So we grabbed an assortment of software off the shelf and started testing, in part to see if the 1.2Mb floppy drive would read the disks, but mostly to evaluate compatibility.

Programs written in Basic for the PC ran without a hitch, which makes sense since Basic 3.0 bundled with the AT contains only minor differences from Basic 2.0 bundled with the PC. Many business packages, including word processing and graphics programs, also worked without a hitch.

One curious result of our testing was an "insufficient memory" message when we tried to install *WordStar*. Our AT had 640K RAM, yet the installation program refused to believe that it was there. We never did get *WordStar* to work, but we learned that *WordPerfect* works quite well.

Of course, the biggest test of PC compatibility is running *Lotus 1-2-3* and *Flight Simulator*. Unfortunately, the AT ran neither. We could start *Flight Simulator*, but the program soon froze.

The biggest question facing prospective buyers is whether the technology is worth the increased cost.

All in all, a little more than half of the PC software we tried on the AT ran without problems. Some loaded fine, but bombed out during operation. Some would not load at all. Our best advice is to try your favorite software first.

Documentation

IBM ships three manuals with the AT: Installation and Setup Manual, Guide to Operations, and Basic Reference Manual. Three other manuals are available: Technical Reference, DOS 3.0, and Hardware Maintenance volumes 1 and 2.

All manuals are in three-ring, loose-leaf binders, making updates neat and easy. Overall, the documentation is clear, well-illustrated, and easy to follow.

The Price of Power

The AT carries a pretty steep price. An AT with 256K RAM and one 1.2Mb floppy drive goes for $3995. The enhanced model, with 512K RAM, one 1.2Mb floppy drive, one 20Mb Winchester, and a serial/parallel expansion board costs $5795. And that does not include the monitor.

The 512K RAM boards are $1125; the 80287, $375; the floor standing enclosure, $165; the network adapter board, $695; and the network translator, $595. Additional hardware is just as pricey.

The Professional Graphics Display sells for $1295; the Professional Graphics Controller for $2995; the Enhanced Color Display for $849; the Enhanced Graphics Adapter for $524; and the Graphics Development Toolkit for $350.

To Buy or Not To Buy

We think the AT is a worthy successor to the PC. The state of the art technology—80286 microprocessor, 80287 numeric co-processor, 3Mb capacity, and 1.2Mb floppy drive—make the AT very attractive. The little touches—CMOS RAM instead of DIP switches, keylock, variable speed fan, multi-lingual keyboard layout, nine-foot long keyboard cord, and "worldwide" power supply—add to its allure.

On the other hand, we were disappointed with other aspects, such as piggybacked 64K chips, only two PC compatible expansion slots, and lack of full networking capability in DOS 3.0.

Although we did not sample the enhanced graphics capability of the AT in action, we certainly appreciate that the option is available.

Of course, price is a major consideration. We would have liked to see much lower prices. Right now, the AT aims for Fortune 1000 and well-to-do professionals, and unless prices come down dramatically, we do not anticipate the market penetration that the PC enjoys. For example, you can buy two PCs for the price of one AT. Then again, you can buy many PC compatibles for the price of one AT.

Furthermore, for those thinking of purchasing an AT and hooking up a network of PCjrs, forget it. The PCjr does not support the adapter board. We think the third party manufacturer who comes up with a system to allow a network of PCjrs to run off an AT will find a waiting market.

We think the AT is a dynamite machine. We think IBM is heading in the right direction, but is not quite there yet. When IBM comes out with a full networking software package, the AT will sell well. If IBM sells it at a more competitive price, AT sales may just take off. If they offer a way to hook PCjrs to a network, PCjr sales will increase too.

The biggest question facing prospective buyers is whether the technology is worth the increased cost. For most individuals, AT power represents overkill. Small businesses can probably get by with PCs. Offices considering setting up a local area network should keep the AT in mind, and seriously consider it once the networking package is available. Multinational corporations can not go wrong in buying the AT. The AT is a state of the art machine at a top of the line price. ■

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PROFESSIONALS ARE MADE NOT BORN

HIGH SAT SCORES. GOING TO THE TOP COLLEGES. ATTAINING PROFESSIONAL STATUS. THESE ARE THE STEPS BY WHICH PROFESSIONALS ARE MADE. CLASS ACHIEVERS™ IS THE CRUCIAL EDUCATIONAL SOFTWARE TOOL YOUNG PEOPLE NEED TO MAKE THE FIRST STEP.

CLASS ACHIEVERS™ Preparing for the SAT is an interactive and intelligent software package which teaches study programs automatically. ***CLASS ACHIEVERS™ is the first educational software package to combine personalized learning methodologies with optimization theory.*** Like a school teacher, the program increases student's knowledge by creating a dynamic environment.

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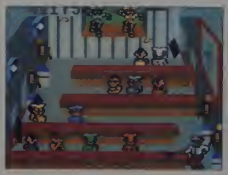
OUR ARCADE GAMES WE BROUGHT

Bally Midway's Spy Hunter puts you in the driver's seat of the hottest machine on four wheels. You're after enemy spies. The situation is life and death. You'll need every weapon you've got – machine guns, and guided missiles, oil slicks and smoke screens. But the enemy is everywhere. On the road, in the water, even in the air. So you'll have to be more than fast to stay alive in Spy Hunter. You'll need brains and guts, too.

Do you have what it takes?



Bally Midway's Tapper would like to welcome you to the fastest game in the universe.

You're serving up drinks in some of the craziest places you've ever seen. And the service better be good, or else. You'll work your way through the wild Western Saloon to the Sports Bar. From there to the slam dancing Punk Bar and on into the Space Bar full of customers who are, literally, out of this world!

Are you fast enough to play Tapper? If you have to ask, you probably already know the answer.

Bally Midway's Up 'N Down by Sega. In this game, a crash is no accident.

In fact, it's the whole object of the game. You'll race your baja bug over some of the worst roads south of any border. Leap dead ends, gaping canyons and oncoming traffic in a single bound. And if anyone gets in your way, crush 'em.

Crashing, bashing Up 'N Down. It's one smash hit that really is a smash.

The #1 Arcade Game of 1984.

Nominated as Most Innovative Coin-Op Game of 1984 by *Electronic Games* magazine.

#1 Arcade Hit, *Play Meter* Conversions Poll, 8/1/84.

WERE SUCH BIG HITS, THEM HOME.

Sega's Congo Bongo rocked the home game world when it shot up to Number 3 on the Billboard chart this spring.

And now it's available for even more home systems. So check the chart and get ready for jungle action. You'll pursue the mighty ape Congo up Monkey Mountain and across the Mighty River. Do battle with dangerous jungle creatures. Ride hippos, dodge charging rhinos and try to avoid becoming a snack for a man-eating fish.

Congo Bongo. It's fast and it's fun. But be careful. It's a jungle in there.

Arcade and Home Smash. Hit #3 on *Billboard* magazine's Top Video Games survey.

Sega's Zaxxon. If you haven't played Zaxxon, you must have been living on another planet for the past few years.

And now the ultimate space combat game is available for even more home systems. You'll pilot a space fighter through force fields and enemy fire on your way to do battle with the mighty Zaxxon robot. Countless others have gone before you in this Hall of Fame game. But this time your life is in your own hands.

Zaxxon killed them in the arcades. But compared to what it will do to you at home, that was child's play.

One of only ten games ever to make *Electronic Games'* Hall of Fame.

	SPY HUNTER	TAPPER	UP 'N DOWN	CONGO BONGO	ZAXXON
Atari 2600 cartridge	NEW	NEW	NEW		✓
Atari 5200 cartridge					NEW
Atari Computers* cartridge	NEW	NEW	NEW		NEW
Atari Computers† diskette	NEW	NEW	NEW		✓
ColecoVision & ADAM cartridge	✓ NEW	✓ NEW	NEW	✓ NEW	✓
Commodore 64 cartridge	NEW	NEW	NEW		NEW
Commodore 64 diskette	NEW	NEW	NEW	NEW	✓
Apple II, IIe, IIc diskette	NEW	NEW	NEW	NEW	✓
IBM PC diskette	NEW	✓ ** NEW	NEW	✓ ** NEW	✓ ** NEW

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✓ Published by Coleco Industries, Inc. under license from Sega Enterprises, Inc.
✓ Published by Synapse Software Corporation under license from Sega Enterprises, Inc
*Atari 400, 800, 600XL, 800XL and 1200XL
(Congo Bongo cartridge 400, 800 and 800XL)
†Atari 800, 600XL, 800XL and 1200XL.
**Also available for IBM PCjr.
All new games are scheduled to be in your stores for Christmas. Check your local dealer.
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CIRCLE 193 ON READER SERVICE CARD

JOHN J. ANDERSON

Junior Meets His Match

Tandy Model 1000

I couldn't have picked a better time to visit Fort Worth. It was 111° in the shade, and the Republican National Convention was in town. Sitting in bumper-to-bumper traffic in the middle of the day, I rolled down the window and pleasantly accosted the driver in the car next to me.

"Wow! Is it always like this at this time of day?"

"Naw. The prezdint is comin'. They awl but shet down thirta-fahv. The spill-over ain't heppin' things none."

My luck. Last time I was in San Francisco I couldn't get across town because of the Queen of England.

Lone Star Savvy, Sociability

Ed Juge, director of market planning for Tandy, had promised the trip would be worth it. I hoped he was right. Many was the time I had not shared the enthusiasm of a marketing director for a new product. And I had come to Fort Worth with absolutely no idea what I was to see.

From Mr. Juge's office on the 17th floor of Tandy Center, you can see practically to North Dakota. Ed himself is a softspoken, likable fella with the rugged, handsome Texas look of a Governor Connally. When he took me to lunch at a shack on the edge of town called The Pit for the best barbecue I ever tasted, I knew we would get along well.

Ed Juge is proud of Tandy, and he is proud of the contribution of Texas to the high tech industry. As well he should be. A New Yorker to the core, I faced my first visit to Texas with a bit of trepidation. What I met was a group of savvy, intelligent, and motivated people whose hospitality is genuine and comes naturally. Texas just may be where America really lives.

"Ah think you're gonna lack what we've got to show ya," Ed said, as we drove back to Tandy's twin towers.

He was right. The Tandy 1000, which should be available at your local Radio Shack as you read this, is the machine IBM was too inept, incapable, or afraid to manufacture. It is sure to put a whopping dent not only into PCjr sales, but into sales of the PC "senior" as well.

To Serve Them All My Days

As owners of PCs and jrs well know, when you buy an IBM machine, you have just begun your indenture. You will soon need a graphics adapter, whether monochrome or color; a printer card of

CIRCLE 159 ON READER SERVICE CARD →

READ ONLY

A review of the IBM Personal Computer Family. Vol. 1, No. 2

HARDWARE NEWS

Progress. Even for a youngster with unusual potential, the IBM PC*jr* has made a lot of progress in its first year.

Consider memory for example. The IBM PC*jr* comes with up to 128KB of internal user memory. You can also add external memory expansion units of 128KB each, up to a total of 512KB. That's far more potential memory than other computers of its price range and weight class (10 pounds).*

Increased memory allows you to take full advantage of the IBM PC*jr*'s powerful 16-bit processor. With up to 512KB of available memory and PC*jr*'s double-sided diskette drive, you can run thousands of best-selling programs that have been developed for the IBM PC. If you're a programmer, the PC*jr* joins the other members of the IBM PC Family as a full-fledged application development tool.

There is also a variety of plug-in cartridge programs, which work faster than diskettes and don't take up any user memory. Three popular examples are Lotus 1-2-3™, PC*jr* ColorPaint, and Managing Your Money™ by financial expert Andrew Tobias. And every PC*jr* comes with cassette BASIC built into the system board.

PC*jr* makes it easy and affordable to start small and grow at your own pace. The $599 PC*jr* Entry Model, for example, comes with 64KB of memory, runs cartridge programs, and can easily be expanded into a diskette model. The PC*jr* Enhanced Model at $999** offers 128KB of memory—enough to run many programs from the IBM PC software library—and a 360KB diskette drive.

*Cartridge-based programs for PC*jr* include Lotus 1-2-3™.*

No matter which model you choose, the IBM PC*jr*'s 13 ports for plug-in options make it easy to add to your system, from more memory, to a modem, joysticks (PC*jr* can accommodate two), color monitor, or other peripherals.

Keys and colors. The IBM PC*jr* now comes with a new typewriter-style cordless keyboard that frees you to work up close or across the room from the system unit.

While PC*jr* can be connected to just about any display, including your TV set, the IBM PC*jr* Color Display offers some real advantages at a very reasonable price.

It has a built-in speaker and an earphone jack for educational and entertainment programs that feature music and sound effects. The non-glare RGB screen gives you better character definition and clarity than a color composite monitor. And since the PC*jr* Color Display is designed to be placed on top of the system unit, it's a space-saving addition to your PC*jr* system.

Whatever monitor you decide to add to your PC*jr* system, there's no extra expense for an additional interface card. Ports for both monitors and serial printers are built in.

*Weight does not include power pack and monitor.

**Prices shown apply at IBM Product Centers.

Lotus 1-2-3 is a trademark of Lotus Development Corporation.

Managing Your Money is a trademark of MECA.

UP AND RUNNING

First String. It didn't take the IBM PC*jr* long to make the team. In its first year of eligibility, PC*jr* was picked by coach Grant Teaff to play a key position for the Baylor University football team.

Coach Teaff has a practiced eye for players with potential. He's coached the Baylor Bears to two Southwest Conference championships. been named Southwest Conference Coach of the Year five times, and was National Coach of the Year in 1975.

The Bears' coaching staff has used computers to help analyze scouting reports and playing patterns of opposing teams for nearly ten years. In the beginning, though, there was a lot of competition for a limited amount of computer time.

Coach Teaff and his assistant coaches had to write up all their game and player information and then have it keypunched. After that came a wait for processing time on Baylor University's mainframe computers, time that had to be shared with other departments and the university administration. Analysis of a game often wasn't available until a week after it had been played.

PC*jr* helped change all that.

Winning Tendencies. Coach Teaff calls the IBM PC*jr* "the ideal football coaching tool." With up to 512KB of available memory, it's powerful enough to make his staff independent of the University's central computers. And PC*jr* and the PC*jr* Color Display are inexpensive and compact enough to be used in offensive and defensive staff meeting rooms.

Using software developed by Coach Teaff, PC*jr* enables the Bears' coaches to enter information as they view game film of an opposing team and to see results immediately. When play-by-play statistics of several games are compiled and analyzed on PC*jr*, the coaches are able to identify tendencies of a team in given situations. They're then able to adjust their own game plan accordingly.

When Baylor plays new opponents, for instance, the two teams exchange films of past games. PC*jr* is used to analyze variables such as down, distance, and type of play. The Baylor coaches enter the game with much the same level of knowledge as if they'd played the new team for years.

The IBM PC*jr* helps out with other coaching duties as well. Team statistics, information about possible recruits, and numerous business and financial chores are all part of its workload.

Other coaches around the country had a chance to see the benefits of computerized coaching techniques this summer when members of the Baylor coaching staff demonstrated their programs at the nationwide football and basketball clinics sponsored by The Coaches, Inc.

Coach Teaff points out that a PC*jr* could make the difference between winning and losing to teams—small high schools, for example—with a limited budget and coaching staff. Using the PC*jr*, he says, "is like adding two or three men to the staff."

Not bad for a 10-pound, first-year player.

WHAT'S THE PROGRAM?

Maximum Security. Some information belongs under lock and key. But the rapid growth of personal computing and computer networks makes it increasingly difficult to keep it there.

Data Encoder software from IBM can help ensure that sensitive information—personnel and payroll records, for instance—is available only to those with a need to know. It uses the Data Encryption Algorithm developed by IBM—and adopted as a U.S. Government Standard—to encode and decode IBM Personal Computer data files and programs.

You don't have to be a master cryptographer to use Data Encoder. For members of the IBM Personal Computer Family with 192KB of memory, there's a full screen interface with menus and help screens. Systems with 128KB use easy

*PC*jr *is a team player for Coach Grant Teaff.*

DOS-like commands. You designate the key that triggers encoding and decoding procedures.

Files protected by Data Encoder can still be sent through IBM Personal Communications Manager or any other communications program with a text transparency feature. Without Data Encoder software and the proper security key, however, the information remains unintelligible.

So much for prying eyes.

In the clear. While some people are determined to keep things confidential, others want nothing less than perfect clarity. The following new members of IBM's growing family of programming productivity tools can help remove that unwanted element of mystery from your application programs.

The IBM Professional Debug Facility can help make short work of improving your assembler language programs. It includes a Resident Debug Tool for full function, full screen interactive debugging, a Disk Repair Program, and a Non-maskable Interrupt card for access to a system that's locked because of program error.

The IBM Personal Computer Application Display Management System (ADMS) simplifies creation of clear, informative screens for application programs. Since screen development is one of the most time-consuming programming tasks, ADMS can help dramatically increase your application development efficiency and productivity.

ADMS consists of two parts. The Application Display Designer is a screen building program that significantly reduces the program coding required for an application. The Application Display Manager is a runtime program that interprets the screen design code.

Screens defined with ADMS remain independent of the application program, so they can be modified or redefined without affecting the logic of the application.

The view from the top. It's worth noting that programs developed with the help of ADMS can run under TopView, IBM's new multitasking operating environment.

TopView's multitasking capabilities allow you to work quickly and efficiently with a wide range of application programs. You can switch rapidly from one program to another without reloading diskettes and can copy information from one application to another. Sales figures from a spreadsheet program and a document from a word processing program, for example, can be used concurrently to produce a sales report combining financial information and text.

In addition, the TopView operating environment supports advanced windowing facilities, data transfer among different applications, and pointing devices such as a mouse. All are features that enable you to work easily with a variety of applications.

Data Encoder software from IBM.

There's also an IBM TopView Programmer's Toolkit available that contains the routines, utilities, and systems related information necessary to develop applications that run under TopView.

FUN AND GAMES

Medieval adventures. The ideal game is easier to define than to find: it should be entertaining *and* enlightening. There are new programs from IBM that manage wonderfully to be both.

King's Quest from IBM, for example, is chiefly for fun but does impart a few important lessons. The hero of this colorful three-dimensional adventure game, the valiant Sir Grahame, is sent by the King of Daventry to search the countryside for three magical items that will prevent the

King's Quest software from IBM.

kingdom's collapse. Along the way, he encounters dangerous creatures, makes new friends, and avoids—or tries to avoid—treacherous terrain.

King's Quest is unusually enjoyable because you interactively control Sir Grahame's wanderings, helping him duck, jump, or swim his way through the quest. Many tasks can be solved in different ways, and more creative solutions are awarded higher scores.

Hence also the educational value. Cleverness and imagination are rewarded. And a few valuable practical lessons are reinforced along the way. Looking, for instance, before one leaps into alligator-filled moats and deep, dark holes.

King's Quest runs on the IBM PCjr and makes good use of some special PCjr capabilities. Sir Grahame's movements, for example, are unusually smooth and realistic because multiple video buffers in main memory are used instead of a single chip to create the animation effects. PCjr's three voice sound creates an impressive variety of sound effects, such as a fanfare of horns when the castle door opens. And PCjr's ability to produce 16 colors lends a touch of realism to an imaginary kingdom.

Modern machines. But can a program with more serious didactic intent be as enticing as Sir Grahame's rough and tumble lessons? Yes, if it's Rocky's Boots™, winner of *Learning* magazine's Software of the Year award and of high praise from *The New York Times*.

In fact, Rocky's Boots from IBM is also a quest for creative solutions to a series of different games. Along the way, both children and adults can learn the basics of electronic circuitry and of the Boolean logic that drives computer operations.

Lest that sound too intimidating, remember that the learning is a by-product of games in which you build various simulated machines on your display screen. Early sections of Rocky's Boots guide you through basic instructions about building and activating simple electronic devices.

You're also introduced to the various "spare parts" and "tools"—such as clackers, boppers, alligators, and alligator detectors—that may come in handy. Later in the program there are more challenging games to play using the machines you've built.

All in all, Rocky's Boots is as thoroughly engrossing as King's Quest. And on one point, at least, it's easier: Sir Grahame has to make do without an alligator detector.

Christmas cheer. Rocky's Boots and King's Quest are part of a special Christmas collection of entertainment and educational software from IBM.

Some others in the Christmas collection come from the same series of IBM learning games as Rocky's Boots. They include Bumble Games™, Bumble Plot™, Gertrude's Puzzles™, Gertrude's Secrets™, and Juggles' Butterfly™. See your authorized IBM Personal Computer dealer, IBM Software dealer, or IBM Product Center for complete details.

The Learning Company reserves all rights in the Juggles, Rumble, Gertrude, and Rocky characters and their names as a trademark and under copyright law.
Bumble Games, Bumble Plot, Gertrude's Puzzles, Gertrude's Secrets, Juggles' Butterfly, Rocky's Boots, and The Learning Company are trademarks of The Learning Company.

HARDCOPY

Full Disclosure. If business applications or entertainment programs aren't what you're after; there's a new software listing available from IBM, one with a long title but a specific purpose: the directory of *Engineering and Scientific Programs for IBM Personal Computers Available from Non-IBM Sources.**

It lists programs in a wide variety of engineering/scientific categories, from Computer Graphics to Lab Automation and Statistical Techniques. The *Engineering and Scientific* directory includes program descriptions, minimum configuration requirements, initial availability dates, and vendor information.

If your department or laboratory is suffering a backlog in application development work, one of these programs—in original form or with a little modification—may be the answer.

Directory of engineering and scientific programs for IBM Personal Computers.

For information about where to get the IBM *Engineering and Scientific* directory, see the box at the end of this issue of *Read Only.*

*IBM has not evaluated these programs and makes no comment, warranty, or guarantee as to their functions, quality, or performance.

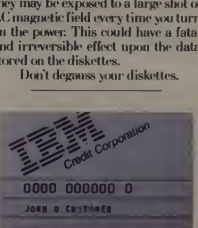
TIPS AND TECHNIQUES

Living Dangerously. Diskettes lead dangerous lives. When they're not being folded, stapled, or otherwise rendered unfit for service, you might think they could at least spend a quiet evening in front of the TV set.

But no. Danger lurks there, too. All color TV sets and many color monitors have a degaussing coil around the face of the tube that demagnetizes the shadow mask inside the tube when the set is turned on.

If you keep your diskettes anywhere near (within a foot or so) the front of your color monitor or TV set, they may be exposed to a large shot of AC magnetic field every time you turn on the power. This could have a fatal and irreversible effect upon the data stored on the diskettes.

Don't degauss your diskettes.



IBM CREDIT CARD

The new IBM Credit Card gives you a convenient way to get started in personal computing or to add hardware and software to your IBM Personal Computer system. It's available with any purchase of $300 or more. You can apply for the card and make a purchase with it on the same day. See your IBM Product Center or participating authorized IBM Personal Computer dealer for details.

For more information about IBM Personal Computer products discussed in this issue of *Read Only*, see your authorized IBM Personal Computer dealer or IBM Product Center. To learn where, call 800-447-4700. In Alaska and Hawaii, 800-447-0890.

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some type; and a joystick adapter too, if you care about that sort of thing. Want to run software? That's a productive idea. In that case you will need to invest in DOS and maybe Basic. Assuming, of course you have already purchased a model that sports a disk drive of some kind.

Okay. End of diatribe one. Let's take a quick look at the machine I saw that sultry afternoon in the sunny South.

Gunning for Big Blue

The Tandy 1000 is built around the 8088 CPU, as are both IBM micros. It comes standard with 128K RAM expandable to 640K; monochrome and color adapters; RGB and NTSC video outputs; a double sided, double density disk drive with 360K capacity; a parallel printer interface that supports both IBM and Tandy printers; two joystick ports; three compatible expansion bus slots with a maximum board length of 10 inches; a jr-compatible light pen interface; and compatible three-voice sound with built-in speaker and external output.

In the box too you will find copies of MS-DOS, Microsoft GW Basic, and the Tandy Deskmate, an integrated software package you will hear about right up ahead.

Think what these capabilities would cost if purchased from IBM; then ruminate on the Tandy 1000 base sticker price of $1200 for everything listed above. Table 1 is a comparison chart of the standard features of the 1000, the jr, and the PC.

The next question that needs to be asked concerns expandability. Let's begin with diatribe two. Being the fun-loving folks they are, the pinstripers at IBM also embedded a humorous side in the PCjr to contrast with the more serious PC. They gave it a funny sort of limp, which does not allow it to upgrade easily into a full-fledged PC. After all, jr should never hope to be as good as his dad—that might impinge on Dad's sales, and we wouldn't want to do that.

The following options are currently available for the Model 1000: second internal disk drive, $300; 128K onboard RAM memory expansion, $300; 300 baud direct-connect modem, $180; RS-232 serial interface, $100; graphics tablet, $60.

Future options include a hard disk interface, light pen, mouse, and networking system; these will be offered at reasonable prices as well.

Diatribe three: if you buy a jr, you will not be able to upgrade it to a full-fledged PC without recourse to radical solutions, which in their course will evacuate your wallet. On the other hand, you can buy a full-fledged PC, and still end up spending over $3000. But at least you'll be able to run a full implementation of Lotus 1-2-3.

You can put together a dual-drive Tandy system with RGB monitor for $1000 less. Table 2 will give you the idea.

Of course the most important question we must ask regards compatibility. The 1000 is, like other PC clones, not 100% compatible with its counterpart. I loaded PC *Lotus 1-2-3*, and it ran flawlessly. Then I booted up one of my favorites, Imagic *Touchdown Football* for the PCjr, and it ran, too—with a couple of anomalies.

First off, because the Tandy 1000 runs twice as fast as the PCjr, sound effects become sound affects. *Touchdown* actually talks, and the effect is funny—like playing an LP at 45, or having Alvin and the Chipmunks call the game for you. Also, color and presentation sometimes varies. This means that a program that uses a red background on the jr may appear as blue on a 1000 due to differences in video circuitry.

According to David Frager, the Tandy 1000 is a PC compatible with enhancements, and wherever possible, those enhancements were made jr-compatible. This guaranteed a large soft-

HARDWARE PROFILE

Name: Tandy 1000 **Type:** desktop computer **CPU:** 8088, 4.77 MHz **RAM:** 128K, expandable to 640K **Operating System:** MS-DOS **Keyboard:** 90 key full-stroke, detachable **Display Resolution:** 80x24, text; 640x240, graphics; 16 colors **Ports:** RGB, NTSC, joysticks, audio output, light pen interface, three expansion slots. **Documentation:** Not available for evaluation at press time. **Summary:** Liable to make life even tougher for old jr. **Price:** $1199

Manufacturer: Tandy Radio Shack
One Tandy Center
Fort Worth, TX 76102
(817)390-2842

Table 1. Comparison of features.

Feature	Tandy	PC	PCjr
128K RAM	yes	yes	yes
Monochrome graphics	yes	option	yes
Color graphics	yes	option	yes
Joysticks	yes	option	yes
Keys on keyboard	90	83	62
Light pen	yes	no	yes
Network	option	N/A	N/A
Hard disk	option	option	N/A
Secondary floppy	option	option	N/A
Printer interface	yes	option	option
DOS/Basic included?	yes	no	no
Bundled Applications?	yes	no	no
PC expansion slots	3	5	0

Table 2. Comparison of prices.

Feature	Tandy	PC	PCjr
Base price	$1199.00	$1999.00	$999.00
Color monitor adapter		244.00	20.00
128K RAM upgrade	299.95		355.00
Printer adapter		75.00	99.00
Joystick adapter		90.00	
DOS and Basic		65.00	140.00
Color monitor	549.95	680.00	469.00
One drive total	2048.90	3153.00	2082.00
Second disk drive	299.95	425.00	
Two drive total	2348.85	3578.00	

ware base at introduction. However, there are some enhancements that are compatible with neither the PC nor the PCjr.

It should also be noted that the IBM PC monochrome monitor circuit is unique. Software written specifically to operate with that adapter will not run on the Tandy 1000—just as it will not run on the PCjr.

As is our advice with all compatibles, make sure the software you want to use runs on the machine you intend to buy. Otherwise, you could be headed for a come-uppance.

The Tandy 1000 is also upwardly compatible with the Tandy 2000. Any program that is written using published IBM PC BIOS calls or written in GW Basic will function on both machines. Programs that take advantage of the unique features of the Tandy 2000, such as ultra-hi-res graphics, will not function.

The Tandy 2000 features high capacity disk drives (720K). This prevents total compatibility with PC disks, while the Tandy 1000 can use actual IBM diskettes. To move from PC or Tandy 1000 disks to the Tandy 2000, software must be copied to a 40-track, double sided format.

Let's not end our examination without a close look at the keyboard of the Model 1000, which is exactly the same keyboard that the Model 2000 sports. It seems that just as they cook the best steaks, Texans design the best keyboards as well. As evidence I present the keyboards of the Tandy 1000 and 2000, and that of the TI Pro.

The Tandy 1000/2000 keyboard features 90 full-stroke keys, with 12 function keys across the top, where they belong. The SHIFT keys are also where SHIFT keys should be, not to be confused with ALTS or INSS or DELS. The ENTER key is big and hard to miss. A full numeric keypad is, of course, standard, as are LED-equipped CAPS and NUM LOCKS. The feel of the keyboard is much superior to that of the IBM PC, and it is much more comfortable to cradle on your lap. I will make no comparison with keyboard(s) for the jr.

According to David Frager, the Tandy 1000 is a PC compatible with enhancements, and wherever possible, those enhancements were made jr-compatible.

Tandy Deskmate

I have always enjoyed saving the best for last, and in this case have a real chance to savor it. I mentioned a ways back that packed into the box with MS-DOS and Basic is a disk called the *Deskmate*. Why is this significant? Well, simply put, once you boot this disk, you might never need another software package for your computer.

DeskMate is an integrated software package that combines word processing, spreadsheet, file management, telecommunications, calendar, and E-mail functions in a single user interface. It includes online help, a simple four-function calculator, alarms that can tie directly to day/date schedules, and a printer interface that services all functions.

As the product was still under development when I played with it, I am not going to attempt a full-blown review of it now. Suffice it to say that it is modeled after the software built into my very favorite portable: the TRS-80 Model 100 (see "Notebook Computing"). It is truly integrated and truly easy to use, and it truly allows you to get your Model 1000 up and productive the moment it is set up. It is the crowning achievement of an extremely impressive system.

Ed reminded me that *Creative Computing* seemed overly eager to point out that the Model 100 was an import in our initial review of that machine, and I admitted that our original signals had been crossed. We did not give Tandy enough credit for the final design of the 100, which was substantially specified by American minds in Fort Worth. With a smile, I followed up by asking him which Japanese company had manufactured the 1000 for Tandy.

I might have been surprised at his response, had I not spent the day having my consciousness raised. The Tandy 1000 was designed entirely by Tandy engineers and is manufactured entirely by Tandy in Fort Worth, TX. That is more than even IBM can say for its machines.

With the 1000, Tandy has elegantly proven an important point: it can be made better, smarter, for less money, and still be made in the U.S.A. ■

CIRCLE 414 ON READER SERVICE CARD

". . . Factoring in drag coefficient, wind velocity, tire inflation, temperature, condition of road, barometric pressure, odometer error and drive train lag, . . . my preliminary calculations indicate I was not speeding . . ."

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RUSS LOCKWOOD

The Newest Contender in the IBM PC Compatible Portable Competition

Panasonic Sr. Partner

For a company that is supposed to be slightly ahead of its time, Panasonic is somewhat behind the times with its IBM PC compatible portable computer, the Senior Partner. Had Panasonic introduced this machine one to two years earlier, going head to head against then unknown Compaq and other PC compatible portables, the features, marketing muscle, and name recognition would have made it a runaway success. Now, Panasonic faces an uphill battle against many firmly entrenched companies selling IBM PC compatible portables—including IBM itself.

Although billed as a portable, the Senior Partner should be considered *trans*portable. It is a heavy machine, about 31 pounds heavy. You will either develop bulging biceps or suffer a separated shoulder if you lug it about more than occasionally. Fortunately, Panasonic attaches a well-padded handle to ease the burden of carrying it.

The Senior Partner is an all-in-one machine; buttoned up it measures 19.75" x 13.5" x 8.25". The detachable keyboard covers the front of the machine, protecting the screen and disk drives. A bar that snaps into place to make the keyboard more secure when transporting the computer, doubles as a fold down stand to raise the front two inches and provide a 10-degree tilt for better viewing of the screen.

The Keyboard

It has been said that imitation is the sincerest form of flattery. Why this should apply to the IBM PC keyboard layout, heaven only knows. We have pointed out the fortes and foibles of the layout many times. If computer manufacturers want to imitate IBM, they should try the Selectric keyboard layout—today's de facto standard for touch typists.

Sadly, Panasonic chose to preserve the layout of the IBM PC keyboard down to the misplaced backslash, the cryptic arrow labels, and the lack of LED lights on the Caps Lock and Num Lock keys.

On the other hand, Panasonic did enlarge the area of the Return, Control, Shift, Caps Lock, Backspace, Insert, Delete, Alternate, Num Lock, and Scroll Lock keys, making them easier to strike. Wisely, Panasonic also preserved the ridge running along the top of the keyboard, which comes in handy from time to time for propping up manuals and books.

In contrast to the heavy system unit, the keyboard is surprisingly lightweight, although it seems somewhat fragile and less sturdy than it should be. The keys are well sculpted, and the feel is reasonably good, although a tad on the mushy side.

What made over 100,000 Apple II owners fall in love with System Saver?

It's the most versatile, most convenient, most useful peripheral ever made for the Apple.

System Saver™ filters out damaging AC line noise and power surges.
70-90% of all microcomputer malfunctions can be traced to power line problems* Problems your System Saver guards against.

Power line noise can often be interpreted as data. This confuses your computer and produces system errors. Power surges and spikes can cause severe damage to your Apple's delicate circuitry and lead to costly servicing.

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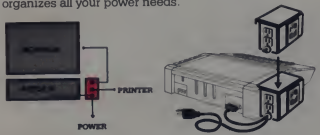

It functions as a multi-outlet power strip with two switched outlets. Plus System Saver offers the ultimate convenience; a front mounted power switch for fingertip control of your entire system.

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Today's advanced peripheral cards generate heat. In addition, the cards block any natural air flow through the Apple IIe creating high temperature conditions that shorten the life of the Apple and peripheral cards.

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*PC Magazine March 1983

System Saver is UL Listed. System Saver's surge suppression circuitry conforms to IEEE specification 587 1980 Category A. Available in 220/240 Volts, 50/60 Hz.

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© 1984 Kensington Microware Ltd System Saver is patent pending

CIRCLE 131 ON READER SERVICE CARD

One of the most innovative features is the way Panasonic connects the keyboard to the main system unit. The connecting cable is inside the system unit. You pop off a plastic cap, pull the coiled cable out and attach it to the keyboard. When finished, the cable snaps back into the system unit. Literally, quite neat.

The Monochrome Display

The built-in 9" green screen has a text resolution of 80 x 25 characters and a graphics resolution of 640 x 200 pixels

One of the most innovative features is the way Panasonic connects the keyboard to the main system unit.

in monochrome and 320 x 200 pixels in color. The built-in character set conforms to the 256-character set of the IBM PC, including standard ASCII characters (letters, numbers, and symbols), foreign and scientific symbols, and graphics characters.

The character image display could be sharper. Unfortunately, the characters have rather pronounced breaks within them, which give the illusion of threadlike lines running through them. This can be bothersome after a few hours on the machine.

Even worse, when scrolling up or down, the screen blanks out for a split second. Talk about distracting—this becomes downright aggravating, rather like having a strobe light for a screen.

The graphics are much better than the text. Arcade games and business programs using graphics ran without a hitch, displaying well-defined shapes and objects.

The System Unit

Like many other IBM PC compatibles, the Senior Partner is based on the 16-bit Intel 8088 microprocessor running at 4.77 MHz. The computer holds 128K RAM, expandable to 512K, with 16K ROM. It comes with one or two half-height, double sided, double density 5.25" floppy disk drives storing 360K. The newest model, the Super Senior Partner, has one floppy drive and a 10 Mb hard disk drive. Our review model has 256K and two floppy drives.

The floppy drives are very loud, far louder than their counterparts in the IBM PC on my desk. We had no problems with the disks and did get used to the grinding noise, but we do wish they were a little quieter.

The drives use a novel door latch that doubles as the disk release. For the ergonomically-minded, Panasonic thoughtfully placed the large letters A and B under the drives, just so you would not get confused about which is which.

Secret Door

At the back of the system unit, a panel covers the interfaces. Behind the panel, you see an RS-232C serial port, Centronics parallel port, and an RGB interface. In addition, the AC power cord connector, a compartment for the power cord, the cord itself, a fuse, display brightness control, optional expansion board slot, and rocker on/off switch are located within the confines.

The Senior Partner uses different parallel connectors than on the IBM PC. For example, instead of a DB-25 pin connector for the parallel port, the Senior Partner uses a Centronics parallel connector. As a result, you cannot share a printer cable.

The Senior Partner allows you to add two optional expansion boards. Our review model came with one memory expansion board, and we discovered that putting boards into the computer is a bit involved; you must remove the printer before you can remove the outer casing. Nevertheless, after a short time, we had the machine apart. Like the IBM PC, expansion boards slide in. A rear slot cover can be removed to access the board interfaces. Putting the machine back together proved easier than taking it apart.

Built-in Thermal Printer

One of the main advantages of the Senior Partner over other transportable computers is the built-in printer. Operating at 55 cps, the printer makes a sound that is scarcely louder than a whisper. Overall, the print quality is good, although letters with slanted and curved lines are not as sharp as they could be.

HARDWARE PROFILE

Name: Panasonic Sr. Partner **Type:** Portable business computer **CPU:** 16-bit 8088 4.77 MHz **RAM:** 128K (expandable to 512K) **ROM:** 16K **Keyboard:** Detachable, 83 keys, slant adjustable **Display:** Built-in 9" monochrome, 80 x 25 characters, 640 x 200 pixels **Disk Drives:** One or two 360K 5.25" floppy disk drives or one Floppy and one 10Mb Winchester **Ports:** RS-232C serial, Centronics parallel, and RGB color monitor **Printer:** Built-in 80" / 132-column thermal printer **Dimensions:** 19.75" x 13.5" x 8.25" **Weight:** 31 lbs. **Operating System:** MS-DOS **Documentation:** Loose-leaf Operations/DOS and Basic manuals **Summary:** Well built, but heavy, IBM PC compatible computer should be considered transportable rather than portable. Bundled with *WordStar, VisiCalc, PFS:File, PFS:Graph,* and *PFS:Report.* The built-in thermal printer is quiet and handy. **Price:** Base system with 256K RAM and one floppy drive $2145

Manufacturer: Panasonic Industrial Co.
One Panasonic Way
Secaucus, NJ 07094
(201) 348-7000

The Super Senior Partner packs a 10Mb hard disk drive.

The rear panel of the Senior Partner contains serial, parallel, and RGB ports. The center compartment stores the power cord during transport.

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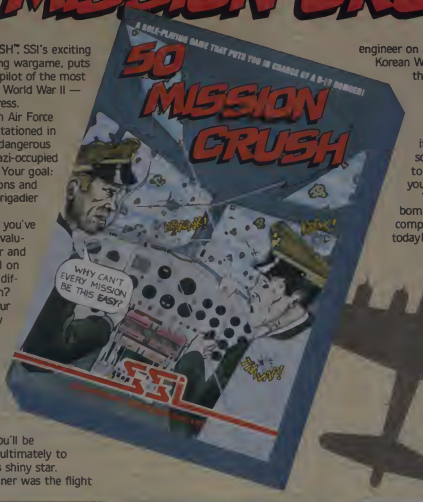

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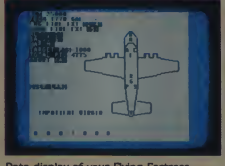

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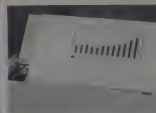

The 55 cps thermal printer is fast, quiet, and prints graphics.

Changing the paper is a snap: lift off the cover; depress a spring release; take out the old roll; and put in a new one.

Bundled Software

The Senior Partner comes with MS-DOS 2.11, Microsoft GW Basic, *WordStar*, *VisiCalc*, *PFS:File*, *PFS:Graph*, and *PFS:Report*—certainly enough to get you up and running with the computer the minute it comes out of the box.

Compatibility with IBM PC software is another question. The Senior Partner could not run *Lotus 1-2-3*, the real benchmark of PC compatibility. However, you can buy *Lotus 1-2-3* version 1A, which runs under MS-DOS 2.11, to work on the Senior Partner. Also, a few extensive Basic programs written for the PC would not run on the Senior Partner. On the plus side, we ran a vast selection of other off-the-shelf PC software, including business, education, and entertainment packages without a hitch.

The documentation is in the loose-leaf manuals so prevalent within the industry. As usual, most seem written by the software manufacturer, with the computer manufacturer's name prominently displayed.

Pricing

The Panasonic Senior Partner carries a suggested retail price of $2145 for a base system with one 5.25" floppy disk drive, 256K RAM, and bundled software. The same system with two floppy disk drives retails for $2595. A plug-in expansion board with 128K RAM (expandable to 256K) sells for $320. The Super Senior Partner, with 128K RAM, one floppy drive, and one 10Mb Winchester costs less than $5000.

The Last Hurrah

The Panasonic Senior Partner is a fine portable computer. The 16-bit 8088 and MS-DOS operating system provide good IBM PC compatibility. Panasonic bundles an enviable selection of software with the machine. It appears solidly built for years of use. You can use the green screen or hook upan RGBcolor monitor.

On the negative side, it weighs a ton. Well, maybe not a whole ton, but it sure feels heavy if you have far to carry it. At least Panasonic included a well-padded carrying strap to cushion the strain. Also, the keyboard has the same idiosyncracies as the IBM PC, and the text display leaves something to be desired.

If you are considering purchasing a portable (make that transportable) IBM PC compatible computer, consider the Panasonic Senior Partner. It is a fine machine with many extras—including a built printer—at a very competitive price. ■

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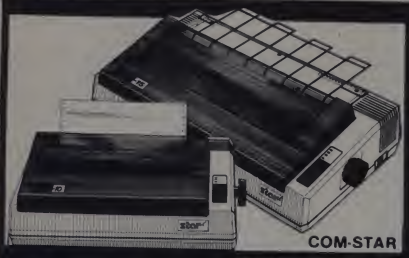

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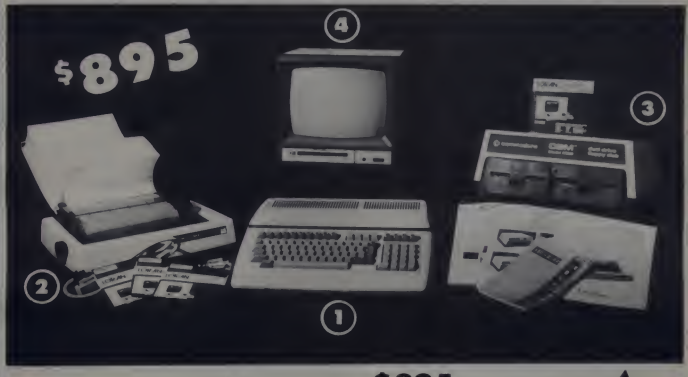

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Sir Clive Enters The Business Market

Sinclair QL

Entire Sinclair QL computer is about the size of a detachable keyboard.

For Sinclair Research, the QL is a major departure from the low-end ZX computers and is the company's first attempt to enter the business market. On the other hand, the QL is like no other business computer.

The sleekly styled machine houses a 32-bit 68008 microprocessor with 128K of memory. Rather than floppy disks or memory cartridges, the QL has two built-in microdrives (about which, more later). The keyboard has 65 almost-full-stroke keys including five function keys at the left side, IBM-style. The QL also boasts multitasking, windows, and four nifty software packages written by Psion, a company who fancy themselves Britain's answer to Microsoft. Couple all these features with an under $500 price tag and you have a winner, right? Let's see.

All-in-One Design

The entire QL computer is about the same size as the detachable keyboards on desktop machines like the IBM PC and Epson QX-10. The layout is extremely tight, but neat. Indeed, earlier prototypes had a ROM cartridge hanging out the back and there seemed to be some question whether everything would fit inside. We had one of the first production machines, and we are happy to report that everything fits.

The QL uses a 68008 mpu running at 7.5MHz which makes it quite fast. The machine uses many custom chips for I/O, graphics, and the operating system. Three 16K ROMs (EPROMs at the moment) contain the QDOS operating system and Sinclair's version of Basic, called SuperBasic. The QL has 128K of RAM which cannot be expanded further internally, although a 512K external memory add-on is promised in the future.

A slot on the back of the QL can accept a ROM cartridge with up to 32K of memory. Presumably, software packages from Sinclair or third party vendors could be put on such cartridges.

HARDWARE PROFILE

Name: Sinclair QL **Type:** Personal/small business computer **CPU:** 32-bit 68008, 7.5 MHz **RAM:** 128K, expandable to 640K **ROM:** 48K (QDOS and Basic) **Keyboard:** 65 keys (inc. 5 function keys) **Display:** 40, 64, or 80 char x 25 lines 512 x 256 pixels (4 colors) **Sound:** Two pitches **Mass Storage:** Two microdrives (tape cartridges with over 100K each) **Ports:** Two RS-232, two networking, two joystick **Dimensions:** 18.8" x 5.8" x 1.8" **Operating System:** QDOS (proprietary) **Software:** SuperBasic, Psion Quill (word processing), Abacus (spreadsheet), Archive (database), Easel (business graphics) **Documentation:** 400-page User's Guide **Summary:** Sleek, compact all-in-one design with multitasking, windows, and excellent software. Good for serious personal user. **Price:** $499

Manufacturer: Sinclair Research, Ltd.
50 Staniford St.
Boston, MA 02116
(617) 742-4826

Add-on memory cartridge (512K) plugs into the left end of the QL.

Microdrive tape cartridges are physically small, but hold over 100K.

The QL has two RS-232 serial ports, two "QL Net" ports (to talk to other QL computers), and two joystick ports, but no parallel printer port. As with the Apple IIc, Sinclair believes that a serial printer will meet the needs of most users.

The power supply for the QL is an external unit with one cable to the computer and another to the wall outlet. Curiously, there is no off/on switch; hence, a switchable power strip or protection box is recommended. There is, however, a reset switch on the right side of the machine, and a yellow LED on the keyboard indicates when the QL is on.

Not Quite Full Stroke

Following what seems to be an emerging European tradition, the QL employs a keyboard that has square keys each of which has a rounded depression in the top. As with the keyboard on the German-designed NCR Decision Mate V, we found it took several hours to get used to it. However, if this is your only computer, the keyboard will probably feel as natural as any other within a few days.

The keyboard lies relatively flat on the work surface. To compensate for this, three small plastic feet are furnished to prop up the back of the machine. We found that they slipped around quite a bit and suspect that users will want to attach the feet permanently or leave them off altogether.

Unlike previous Sinclair computers, the QL offers no single stroke keyword entry. Indeed, the keyboard looks rather conventional with its ESC, CTRL, ALT, and function keys. The first three function keys are used the same way in each of the furnished Psion programs. F1 requests help, F2 toggles the upper screen prompt area on and off, and F3 selects the command menu.

Unfortunately, the cursor directional keys are located on either side of the spacebar, left/right to the left, and up/down to the right. We prefer a logical diamond arrangement. The left and right arrows in conjunction with the CTRL key act as delete keys. In fact, the keyboard editor is quite powerful. By using various combinations of SHIFT, ALT, and CTRL with the cursor keys, you can delete words or lines and quickly move the cursor around the text. Like so many low end computers, the QL offers no indication as to whether CAPS LOCK is on or off; this is annoying, especially since you can so easily hit the key by mistake and find yourself with everything in capitals.

Microdrives

A microdrive uses a tiny (1.5" x 1.8") continuous loop tape similar to the ill-fated Exatron stringy floppy. Sinclair has put a great deal of effort into the development of these drives and began to deliver them in substantial quantities for the Spectrum a bit over a year ago. The QL tapes are formatted differently, but the mechanism is the same, so it should be reliable.

Each cartridge contains 200 inches of tape with a theoretical capacity of 255 sectors of 512 bytes each for a total of 128K; in actual use, less than this will probably be stored on a cartridge. Cartridges must be formatted before use; this can be done with a single command from Basic.

All of the applications programs are furnished on microdrive tape cartridges. The program cartridge always occupies the left (1) slot, and a data cartridge, if required, occupies the right (2) slot. Up to six additional microdrives may be connected through an expansion port on the side of the machine.

The microdrive moves the tape at a speedy 28 inches per second; thus the tape completes one circuit every 7 1/2 seconds. This would suggest 7 1/2 seconds is the maximum access time for data or programs. Not so. In practice, loading a large program or data file took about 70 seconds. Even requesting the help screen in an application program took upwards of a minute.

In monitor mode, an 80-character width screen is automatically split into two vertical windows.

Like standard tape cassettes, each microdrive cartridge has a write protect tab on its right side. We found it a bit unfriendly that the QL will repeatedly attempt to write to a protected cartridge and will not halt until the cartridge is removed.

Perhaps the biggest question is whether the microdrive will handle serious business applications adequately. You can argue that a cartridge holds about 65% as much as a single-density floppy disk and the access time is two or three times as long, but still quite tolerable. Also, in their little binders, four microdrive cartridges take very little space on the shelf. Nevertheless, we don't think that the majority of business users will find the microdrive an acceptable alternative to floppy disks.

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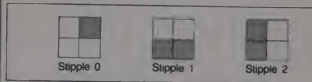


Figure 1. Two colors can be mixed in four stipple patterns.

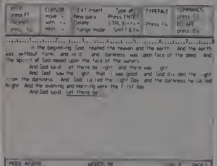
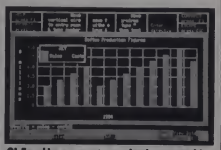


Figure 2. Sample screen from QL Quill word processing package.



QL Easel is an easy-to-use business graphics package.

Windows and Screens

When the QL is turned on or the reset button pressed, on the screen is displayed the message "F1 for monitor; F2 for television." If you press F2, you get a 64-column display. We had no trouble viewing 64 columns on a standard 13" Sanyo TV set. Indeed, we found we could "push" it to 80 columns. However, to allow the use of older or lower quality TV sets, the character width can be set to 40. Oddly, with the width set to 40, Basic writes only 37 characters across the screen.

While a TV set is a satisfactory display device, it is much more interesting to use a monitor. The QL provides output signals for both RGB and NTSC (composite video) monitors. In monitor mode, an 80-character width screen is automatically split into two vertical windows. The left window shows the program listing while the execution takes place in the right window.

Although the default windows are half the width of the display, you can specify any size window you wish. The BORDER command allows you to add a border to a window. PAPER allows you to specify the background (paper) color, and INK specifies the type color. Within a window you can scroll vertically with the SCROLL command and horizontally with the PAN command. Interestingly, these commands work in two directions (up and down, and right and left). We found these commands did not work quite as we expected; after information was scrolled out of a window it seemed to be gone and we couldn't get it back without re-generating it.

As implied earlier, text resolution can be 40, 64, or 80 characters by 25 lines while graphics resolution is 512 x 256 pixels with four colors or 256 x 256 with eight colors. Colors can be either a solid color or a "stipple." A stipple is a mixture of two colors in one of four specified patterns (see Figure 1). Stipples will be reproduced correctly only on a monitor and will shimmer on a TV set.

The graphics system implemented in SuperBasic is quite powerful and automatically compensates for the rectangular shape of screen pixels when drawing circles and other shapes. A thoughtful touch is the placement of the origin for graphics figures at the lower left (as you are taught in geometry) rather than the upper left (as on most computers). The vertical (y) direction has a default dimension of 100 while the dimension of the x direction depends upon the size of the window. If a figure exceeds the output window, then it is correctly cropped. The SCALE command allows the scale to be changed and the origin moved. Other graphics commands include CIRCLE, ARC, LINE, POINT, and FILL.

SuperBasic

SuperBasic is a refreshing departure from previous Sinclair Basic implementations as it is very close to Microsoft Basic with the addition of several nifty turtle graphics commands and the window commands mentioned above.

In addition to the graphics commands discussed in the previous section, the QL has a MODE command which lets you switch between 512- and 256-pixel screen widths.

For ease of program editing, SuperBasic has automatic line numbering, renumbering, and on-screen editing; although to use this latter facility, you must invoke the EDIT command. Immediate mode commands can also be edited with the last one being held in memory until the next one is entered.

Five turtle graphics commands (from Logo) are implemented in SuperBasic. They include PENUP, PENDOWN, MOVE, TURN, and TURNTO angle (which turns the turtle to a specific heading).

Most of the other facilities will be familiar to users of Microsoft Basic, although the command syntax is occasionally different.

In addition, there are some confusing inconsistencies. For example, in some cases spaces are needed between commands and their arguments, but not in others; similarly, procedures are defined with the arguments in parentheses and then used without them. There are some other strangenesses, all of which contribute to potential confusion for both novice and experienced users.

Operating System

SuperBasic and the various applications software packages all run under QDOS. For the most part, QDOS is transparent to the user as it schedules tasks, allocates resources, performs I/O, polls the keyboard and other ports, and manages memory.

QDOS supports a multitasking environment; therefore, a file can be accessed by more than one process at a time. The QDOS file system can handle both files that have been opened for exclusive use by one program or for shared use.

All I/O is device independent. You simply specify a channel (not a device) with an OPEN statement and direct data and files to that channel. Obviously, you must have an appropriate device connected to that channel if you expect to capture the output.

Word Processing

Furnished with the QL is a package

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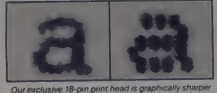

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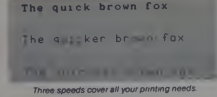

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produced by Psion, *QL Quill*. This is a "what you see is what you get" word processing system which even allows underlining, superscripts, and subscripts.

The screen is divided into three areas (see Figure 2). The top is a control area and shows the meaning of the function keys, current mode (overstrike or insert), and current typeface. If the command key is pressed, the list of available commands show in this top area. These commands allow changing the format of the document, saving, loading, and the like.

A ruler line appears below the control area to show margins and tab stops.

At the bottom are two lines which show the mode, word count, current line and page, document name, and typeface (normal, bold, or underline).

This leaves 18 lines in the center of the screen for display of your text or, if you toggle off the control area, 22 lines for text.

We used *Quill* quite extensively and found it was very capable.

Like any word processing package, it has some idiosyncrasies that were mildly annoying. In particular, it always indents a paragraph. While you can specify the number of spaces to indent, you can't defeat the indent no matter what. When the system is loaded, it is in right justify mode. If you want an unjustified document and forget to change the format at the start of the session, you can re-format the text later, but it will take nearly two minutes per page to perform the operation. While you are entering a document, the system will occasionally spin the microdrive without warning. Presumably, this is just QDOS doing its thing, but it is disconcerting.

Nevertheless, we have no serious complaints about *Quill*, and we feel it is well matched to the computer.

Other Applications Software

QL Abacus is a full-featured spreadsheet package which would have received high marks in our spreadsheet roundup in the June issue of *Creative*. Like *Quill*, it has a control area at the top of the screen and a two-line status area at the bottom. It has an extensive set of built-in math, statistics, and business functions including net present value, rate of return, and table lookup. About the only obvious missing function was a sort facility.

QL Archive is a database, more properly called a file manager. The default layout is very similar to a 5 x 7 index card, although you can design your own layouts. Since the QL has no character graphics (only Greek and various accented letters), forms must be designed with ASCII characters like hyphens, colons, and brackets.

QL Quill is a "what you see is what you get" word processing system which even allows underlining, superscripts, and subscripts.

The real power of *Archive* becomes apparent when you start to use its own database language, a language nearly as powerful as Basic, but oriented to file manipulation. You can create a named procedure to do exactly what you want and then use it as an additional command just as you use the other *Archive* commands.

We had the most fun with *QL Easel*, a business graphics program. This is an exceptionally friendly program that allows the creation of line, bar (horizontal and vertical), and pie charts. You can vary nearly everything: colors, sizes and shapes of bars, labels, and formats. You can even combine two types of plotting on a single graph.

We made one bar chart and kept adding bars. At first the screen provides space for 12 bars (months), but when you specify the value for the 12th one, the screen is automatically reformatted for 20 bars. This process continues to 30, 45, 78, 100, and eventually to more than 600 bars. Furthermore, if a vertical bar extends beyond the defined range, the screen is automatically reformatted and redrawn. All together, a nifty package!

Documentation

The documentation for the QL is in a single large-format ring binder. It includes a 12-page introduction, 113-page beginner's guide (actually a Basic tutorial), 57-page keyword reference guide, 52-page discussion of the concepts and technology of the QL, sections on each of the four Psion software packages, and a section of miscellaneous technical information (installing printer drivers, transferring data to other computers, guarantee, etc.). In total, the manual contains 400 pages—all typeset and well-illustrated. We were impressed!

At the moment, the Sinclair QL is the lowest priced 32-bit microcomputer on the market.

Pricing

The QL comes as a bundled unit including computer, User's Guide, power supply, cables, four software packages, four blank microdrive cartridges, and three plastic feet. The U.S. price has been set at $499. Initially, the QL will only be available by mail order directly from Sinclair, but later it may make its way into some retail outlets.

In Summary

At the moment, the Sinclair QL is the lowest priced 32-bit microcomputer on the market. It is a technologically advanced machine and packs a tremendous amount of capability into a small package.

Although it is bundled with a good complement of capable software for the business market, we feel the microdrive storage system, European-design keyboard, and mail order sales and service policy will prevent the QL from receiving widespread acceptance among business users, at least not as the primary computer of the company.

On the other hand, the *QL Easel* business graphics package is outstanding, and it alone may justify the purchase of the system, especially for a business which already has an Epson FX80 (which prints the graphics output exactly). The QL may also represent a good buy for company employees with occasional computing requirements.

In addition, we think the QL may also be a good choice for the serious home user or person running a part-time business. Welcome back to the U.S., Sinclair. ■

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R = ROM (Cartridge)
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ITT Xtra

Like the IBM PC, the Xtra consists of three components: a display, a detachable keyboard, and a system unit housing the cpu, disk drives, and electronic innards of the system. Yet the Xtra lives up to its name, offering a few extra touches to differentiate it from the competition.

System Unit

The system unit lacks the sleek lines so prevalent among its competitors. Indeed, it looks rather boxy. However, the purpose of this rather utilitarian design is flexibility. You can place the unit horizontally or, if desk space is tight, vertically.

Inside, the usual 16-bit 8088 microprocessor, 128K RAM (expandable to 256K), and 32K ROM (expandable to 64K) reside on the motherboard. The Xtra supports the 8087 numeric coprocessor, and five expansion slots allow you to install memory, graphics, and other expansion boards. A RS-232C serial port, which can handle up to 9600 baud, and a parallel port are included.

The system unit also houses two half-height disk drives. Storage capacity for floppy disks is the standard 360K. For those with larger requirements, an optional 10Mb Winchester hard disk drive is available. Both work flawlessly whether the system unit is horizontal or vertical.

The Xtra goes through a reassuring diagnostic self-test each time you power up the machine.

Keyboard

At first glance, the ITT Xtra keyboard looks just like an IBM PC keyboard. However, closer inspection reveals an ergonomic keyboard that corrects most of the problems of the IBM PC keyboard.

The detachable keyboard is con-

HARDWARE PROFILE

Name: ITT Xtro. **Type:** Small business comptuer. **CPU:** 16-bit 8088 4.77 MHz. **RAM:** 128K (expandable ta 640K). **ROM** 32K (expandable ta 64K). **Keyboard:** Detachable, 84 keys, slant adjustable. **Display:** 80 x 25 chorocters 320 x 200 pixels. **Disk drives:** One or two 360K 5.25" floppy drives or one flappy drive and one 10Mb Winchester. **Ports:** One RS-232C seriol and one parallel. **Dimensions:** System unit: 15.6" x 14" x 5.6". Keyboord: 18" x 8.1" x 1.5". Disploy: 15.3" x 12.5" x 14". **Operating System:** ITT DOS (MS-DOS). CP/M-86. **Documentation:** Loose-leof user's guide, DOS, ond Basic manuols. **Summery:** Anather quality IBM PC compatible offers flexible modular design at o competitive price. Excellent documentation o real plus.. **Price:** Base system 128K, one floppy drive, and monochrome monitor $2495. Other configurations to $6125.

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CIRCLE 112 ON READER SERVICE CARD

The rear panel of the Xtra. Note the five expansion slots and serial and parallel ports.

The ITT Xtra keyboard corrects many of the deficiencies of the original IBM PC keyboard by providing standard Selectric layout, LED lights, an Enter key on the numeric keypad, and larger Return and Shift keys.

The display base tilts and swivels the monitor for a comfortable viewing angle. The knob adjusts the brightness of the screen.

The system unit lies flat (left) or stands on its side (right).

nected to the system unit by a six-foot coiled cord. The keyboard is slant adjustable with three height settings—one more than the IBM PC keyboard. The keys are well sculpted, and the touch of the keyboard is fair to good. Keystrokes are very quiet, with little aural feedback.

The Xtra uses a standard QWERTY layout and succeeds in placing the Shift and Return keys in their proper places. ITT replaces IBM's cryptic arrows with word labels and includes green LED lights on the Num Lock and Caps Lock keys. Raised bumps on the J and F keys help touch typists keep their fingers in place.

The numeric keypad doubles for cursor control and includes special cursor keys Home, End, Page Up, and Page Down. ITT places an extra Enter key on the keypad and adds a raised bump on the 5 for fast data entry.

The only nitpicking we could do on the keyboard was a sticking Shift key. Most of the time, it did not bother us. However, from time to time, we found ourselves typing in capital letters—annoying to be sure. No other keys stuck—just that one Shift.

Display

The Xtra supports three types of monitors: 14" monochrome (amber), 14" monochrome (green), and 12" RGB color. The monitor mounts on a pedestal that tilts roughly 30 degrees upward and swivels 90 degrees from side to side. This helps position the screen for the most comfortable viewing angle. The pedestal has a knob for adjusting the brightness of the monitor.

Character resolution is 25 rows of 80 characters, with the character set the same as the IBM PC. Character display attributes include normal, blinking, underlined, and half intensity in either normal or reverse video.

The display has a resolution of 640 pixels by 400 pixels using bit mapped high-resolution graphics and 320 pixels by 200 pixels using medium-resolution graphics. Graphics statements and commands are implemented in Microsoft GW Basic, which is a refinement of Microsoft Basic for MS-DOS operating systems that includes special graphics and sound capabilities.

Mouse Fever

The Xtra supports a mouse, which plugs into the keyboard port. Both mouse and keyboard can be used at the same time. We did not receive the ITT mouse and so cannot comment on how it or the VisuAll mouse software works with the Xtra.

Software

ITT boasts a "growing" library of software available for the Xtra, including *ITT WordStar*, *ITT Multiplan*, and *ITT Easywriter II*. Of course, the main attraction of the Xtra is its compatibility with IBM PC software.

The de facto standard of IBM PC compatibility is running *Lotus 1-2-3*. The Xtra ran version 1A with no problem, which seems to indicate that it will run just about everything—well, almost. We tried running some Basic programs written for the IBM PC, and the Xtra refused to load them. On the other hand, many business and game programs, such as *WordStar* from MicroPro, *Please* from Hayes, and *Olympicks* from Edupro ran without a hitch. Based on the *Lotus 1-2-3* test, we feel confident that the Xtra will run most software. However, if you are uncertain about a particular program, try before you buy.

Documentation

Give ITT a round of applause for including clear, profusely illustrated documentation with the Xtra. This little extra touch is worth its weight in gold.

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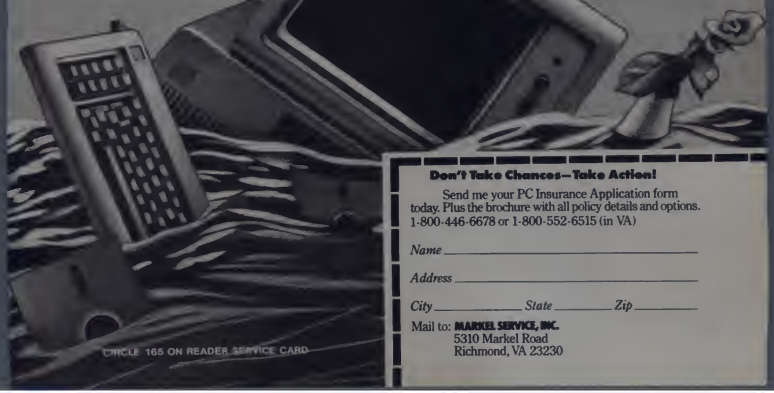

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All manuals are in three-ring loose-leaf binders, which make updates neat and easy to insert.

The User's Guide takes you from setting up, through mastering some of the most commonly used DOS commands, to installing optional equipment yourself. The ITT DOS and Advanced Basic manuals seem to be more than the standard guides issued by the manufacturer, taking the time to explain and give examples to help you understand and use

Give ITT a round of applause for including clear, profusely illustrated documentation with the Xtra. This little extra touch is worth its weight in gold.

the Xtra. All contain handy quick reference pamphlets.

Pricing

ITT offers four configurations of the Xtra.

Model 1 includes 128K RAM, one floppy disk drive, and a monochrome monitor for $2495. Model 2 has 256K, two floppy drives, and a monochrome monitor for $2995. Model 3 provides 256K, one floppy drive, one 10Mb Winchester, and a monochrome monitor for $4995. Model 4 has 640K, one floppy drive, one Winchester, and a monochrome monitor for $5695. In all cases, adding a color monitor adds $500.

The Bottom Line

The ITT Xtra is certainly an excellent IBM PC compatible. The modular design offers a great deal of flexibility, and the numerous little extras—tilt/swivel pedestal, ergonomic keyboard, build-in parallel and serial ports, and dynamite documentation—are added bonuses that might well cause you to choose the Xtra over other compatibles. Of course, a competitive price does not hurt either.

The Xtra ran lots of IBM PC software, including *Lotus 1-2-3* version 1A. Our advice with the Xtra, as with other compatibles, is to test any software that you require.

All in all, the ITT Xtra compares favorably with the competition. Businesses and professionals on the road to computerization would do well to consider the ITT Xtra. ■

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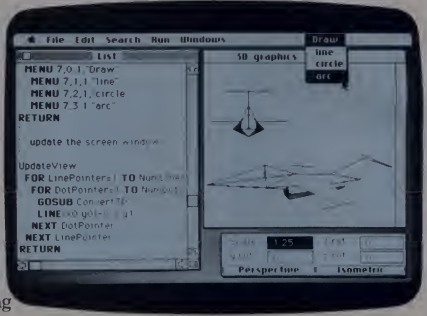

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CIRCLE 167 ON READER SERVICE CARD

JOHN J. ANDERSON

Selling a Product Before Its Time

STM PC

It's a stock line, but it's true: when a manufacturer thanks me for giving his product a good review, I sometimes reply that it is easy to write a good review of a good product. Enthusiasm translates into momentum. When I'm pleased with the way something works, the words come easily.

More rarely, I come upon something utterly stinky. Fact is, it is also rather easy to write a really bad review of a really bad product. In that case it is disgust that translates into momentum. When something is truly a piece of garbage, it takes very little effort to say so.

A Troubling Assignment

Between those two poles, the job becomes much more difficult. Not that I'm complaining, of course. But in the case of a product like the STM micro, to sit down and create a coherent point of view is nearly impossible. No matter what approach is taken, it is likely to be interpreted as a cop-out. It is a complex situation, you see. The machine has some neat, innovative features that you won't find anywhere else. And it has some wooly mammoth problems—with tusks, folks.

A Beauty on the Drawingboard

The STM PC measures 11" x 20" 4" and weighs just over 17 lbs. I would classify it as a portable but for the fact that it must be powered from a wall outlet. So let's call it a transportable. It's CPU is an 80186 chip, which is twice as fast as the 8088 you find inside the IBM PC. It ships with 256K RAM standard, expandable to 512K. It sports two quad density drives similar to those on the Tandy 2000, which can read but not write to standard formatted disks. The drives hold 720K each. They are half-height drives, and stacked on top of each other are only 3" high. You can also order them in 360K format for "enhanced" compatibility.

Most fascinating about the STM machine is its full-screen LCD display, which provides 80 columns by 25 lines in the text mode and 480 x 200 pixels in the graphics mode. The LCD is built-in to the system unit, pre-angled at about 15°. The display measures 10" x 3" and includes a contrast control and a switchable backlight.

As if that weren't enough, the STM also has a built-in autodial/autoanswer 300/1200 baud speakerphone/modem, and a built-in thermal printer. The keyboard is very rakish—only 7" x 14" and lightweight—and key placement is excellent. The keyboard hinges into the system unit when not in use.

On the back of the unit you'll find a parallel printer port, RGB and NTSC video outputs, hard disk controller interface, two serial ports, and an acoustic coupler jack next to a modular phone jack.

Bundled with the package is the STM version of MS-DOS and the *Wordstar* work-alike word processor, *New Word*. Basic is optional.

But Compromised, Rushed

So here is a machine that should have a good chance of getting a rave. It is not just another PC clone, but a machine that attempts to synthesize some new ideas. I respect that, and I admire it. It is better to take a risk and maybe fail than just to follow the crowd—at least from the point of view of a nonstockholder.

Somewhere along the way, however, things went seriously awry for the STM PC. What started out as a strong design on paper seems to have been worked and reworked—and seriously compromised, to say the least. The STM PC is a good idea gone wrong, and it's a pity.

Setting the machine up I was amazed at how thin its plastic casing is. The darned thing actually groans when you move it around. Drop this baby on

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HARDWARE PROFILE

Name: STM PC. **Type:** Transportable micro. **CPU:** 16-bit 80186. **RAM:** 256K. **Operating System:** MS-DOS Voriant. **Keyboard:** 83-key, full-stroke, detochable. **Display Resolution:** 80 columns x 25 text, 480 x 200 graphics. **Ports** RGB, NTSC, porollel, seriol, hord disk, modem, phone jack. **Dimensions/wt:** 11" x 20" x 4" /17lbs. **Documentation:** Foir/poor. **Summary:** An interesting concept with questionoble execution. **Price:** $3450.
Manufacturer: STM
535 Middlefield Rd. Suite 250
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(415)326-6226

the floor, and it will shatter like crystal.

Then there is the LCD display. It is virtually illegible. With or without backlight, regardless of the contrast setting, we couldn't bring it in satisfactorily. It reflects ceiling lights something fierce, and that 15° angle is utterly fixed.

When you think about it, what is the purpose of an LCD display on a machine that cannot run on batteries? The STM is locked into the need for AC power, and that implies that a CRT can be brought to the scene without too much difficulty. You will certainly want a CRT with the STM, which renders the LCD a superfluous waste of money.

The printer on this machine has some problems, too. It uses 4" thermal paper, which isn't big enough for anything much more useful than laundry and grocery lists. What useful documents could you turn out at that width? Compounding the problem is the fact that the printer is abominably slow (less than 10 cps), and its print quality is low. What's more, the operating system doesn't even recognize the internal printer. All you can do is serially transmit ASCII files to it.

Obviously the STM was designed to work with an external printer. That makes the inclusion of the thermal kludge a highly questionable proposition, and certainly, a further waste of money.

To make matters worse, the keyboard feels rather cheap. It is so light that it moves under your fingers as you type, and, like the system unit, does not suggest sturdiness. The disk drives also seem somewhat cheesy. They use a pushbutton eject system that is inconvenient, and it is hard to tell whether or not a disk is fully inserted. The LEDs on the drives themselves are positioned in such a way as to be absolutely out of view, unless you happen to be sucking on the keyboard.

The documentation is singularly lacking. It seems rushed and incomplete. It is possible that the documentation we received was preliminary—I pray it is so, but fear it is not.

Then I made the mistake of trying to boot some PC software. About the only thing that ran without a hitch was *New Word*, supplied with our evaluation unit. The STM PC is the least compatible PC compatible I have ever encountered. I wanted to believe our unit was damaged somehow, but the DOS disk, *New Word* and *Lotus 1-2-3* booted just fine. Too bad, as this led to a damning conclusion. STM claims to be righting the situation now. I certainly hope that is true.

The LEDs on the drives themselves are positioned in such a way to be absolutely out of view, unless you happen to be sucking on the keyboard.

To top off my complaints, I must report that talking to someone knowledgeable at STM is a tough job. As far as technical support goes, well, I guess it was just bad timing for three calls in a row.

So Back to the Drawingboard

As I said in the beginning, it is difficult to draw any real conclusions in a case like this except to say "gee, too bad," or "better luck next time; do keep on trying." To potential buyers, I must say "wait and see, don't buy this now." The only other suggestion that comes to mind is to keep a lookout for reviews of this machine in the other magazines and use them as a yardstick. If they say things like "great choice," or "a traveling executive's dream," you'll know where they stand on editorial integrity. ■

CIRCLE 119 ON READER SERVICE CARD →

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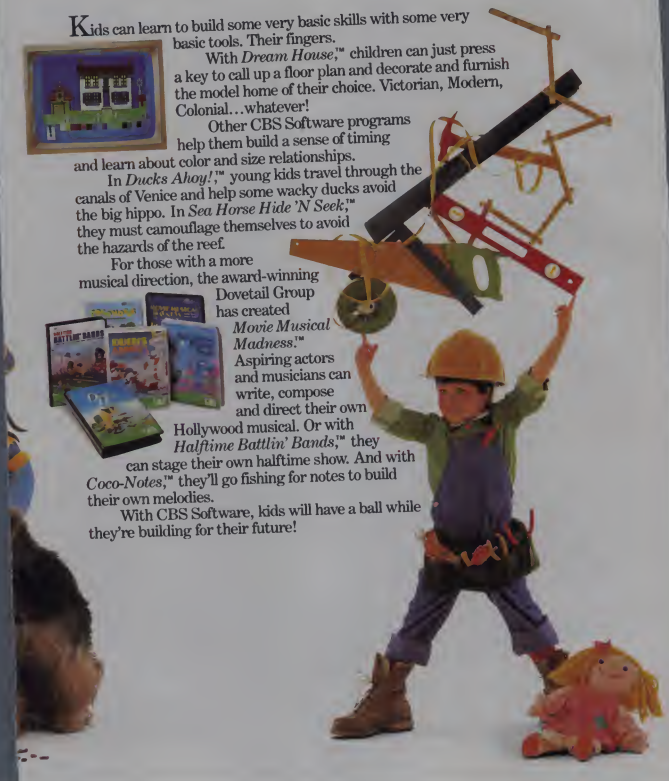

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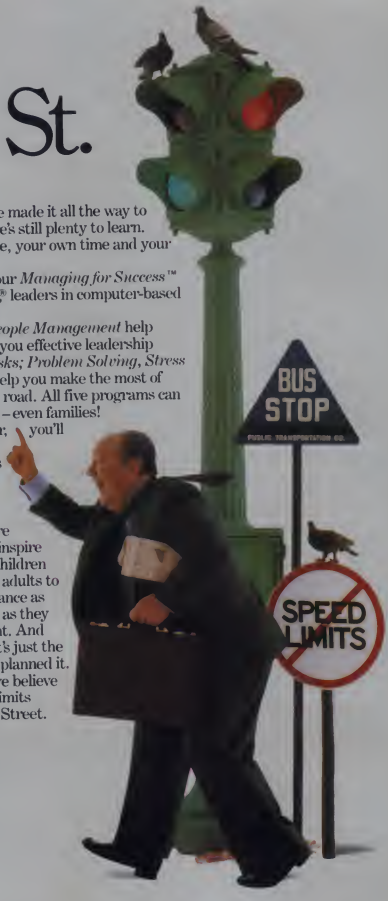

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DAVID H. AHL

Tandy Disk/Video Interface

Although the Model 100 is great for travelling, the lack of a reasonable size display and limited storage capacity are severe drawbacks to using it as your main computer in the office or home. Now, Tandy has a solution. The Tandy Disk/Video Interface gives you both 40- and 80-column composite video output (for a monitor or TV set) and a single 5¼" disk drive (with room for an optional second drive). The disk with the Interface includes the operating system and Disk Basic. Approximately 170K is available for storage of user programs.

The Disk/Video Interface connects to the Model 100 by means of a 20" ribbon cable that terminates (at the Model 100 end) in a 40-pin DIP connector. As owners of Apple joysticks know from bitter experience, a DIP (dual inline package) connector has 40 easily-bent pins. (Our Interface arrived from the previous reviewer with 26 of the 40 pins mangled.) To minimize problems with the pins, Tandy includes a quick release adapter socket that plugs permanently into the female connector on the bottom of the Model 100. Nevertheless, we would have preferred an adapter that terminated in something other than a DIP connector, but perhaps size dictated the choice of connector.

Incidentally, if you have any ROM software installed in the bottom socket on the Model 100 (say *Disk+* from Portable Computer Support Group), it will not interfere with the use of the Disk/Video Interface as it uses a different socket.

This Disk/Video Interface comes with a 64-page manual consisting of four sections. The first provides general information on installation and use of the system. Part 2 describes all the new disk Basic commands. The third section describes the file structure and format of the floppy disks, while the last section is a set of appendices detailing the technical aspects of the system, error codes, and ASCII character tables.

Firing Up

Once you have connected everything up and turned on the system, a message appears on the CRT indicating a correct startup. Interestingly, you still use the menu on the Model 100 to select what you wish to do.

Parameters such as screen width (40 or 80 columns) and function key labels on or off (on bottom line of screen) must be set from Basic. From then on, everything that you do from any program—Basic, Text, Telcom, Schedule, and Address—appears on the video display except, as mentioned, the main menu.

The operation of all the programs is exactly the same as with the LCD screen, except you see three to six times as much on the display. Files are saved in the normal way, except that to save to the disk, you must precede your file name with a 0: indicating disk drive 0.

The manual makes much ado about disk Basic, and indeed there are several additional commands for file access and the display, but it is hardly the much extended Basic that the manual implies. Additional file commands include OPEN, CLOSE, PRINT # (write to disk),

HARDWARE PROFILE

Product: Disk/Video Interface **Function:** Adds disk storage and video display capabilities to the portable Model 100 computer. **Disk Drive:** 5¼", 170K **Video Display:** 40 or 80 characters x 25 lines **Software:** Limited operating system, Disk Basic **Dimensions:** 12.6" x 12.0" x 5.2" **Documentation:** 64-page manual **Price:** $799

Manufacturer: Radio Shack
Tandy Corp.
1700 One Tandy Center
Ft. Worth, TX 76102
(817)390-3011

The Tandy Disk/Video Interface contains a single 170K 5¼" floppy disk drive with room for an optional second drive. It provides both 40- and 80-column composite video output for a monitor or TV set.

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INTERFACE (CONT'D)

INPUT # (read from disk), LINE INPUT # (read line of data), DSKO$, DSKI$ (write and read string in specified sector), LOC, LOF, and EOF.

Two video functions were added: CSRLIN (returns vertical coordinate of cursor) and POS (returns position of cursor). In addition, CHR$(27) can send to the video screen any of 20 control codes, including cursor up, cursor home, erase to end of line, insert line, clear display, reverse video, and move cursor to a specified location.

The disk with the system also includes two utility programs, FORMAT and BACKUP.

Compared to a state-of-the-art desktop computer, the disk drive is relatively slow, which is not surprising given that it doesn't use a true operating system. On the other hand, it doesn't seem slow at all because you are usually moving comparatively small amounts of data back and forth.

Worth The Price?

The Disk/Video Interface is easy to install (despite our quibble with the DIP connector) and easy to use. It works well, and the documentation is very good.

However, the unit is priced at $799, and Tandy seems to be holding the price line. This seems quite expensive considering that you can buy an entire computer, disk drive, and monitor for about the same amount. However, that is probably not a fair comparison, and therein lies the rub: there is no directly comparable product.

If your main application is text editing, an alternative to the Disk/Video Interface is a disk load program like the ones available from Kensington Microware and Portable Computer Support Group (PCSG). For example, *Disk+* from PCSG lets you save and load files back and forth between the Model 100 and a desktop computer through the RS-232 port. Those files can then be edited with a word processing package on the desktop machine. Complete with cable, it costs about $120. Many desktop computers, including the IBM PC (and clones), Epson QX-10, and TRS-80 Model III and 4, are supported.

However, if your goal is to have your Model 100 serve as your primary computer both on the road and at home base or if the extended file capabilities of Basic are important, the Desk/Video Interface is a capable and worthwhile product. ■

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This month we depart from our regular Growing Up Literate format for a special comparison of Logos, a topic that should interest educators and parents alike. Next month we will return to our regular format.—EBS

A Comparison of Logos: Today's Turtle Is No Slowpoke

Turtles and mice are the "in" animals in the personal computer field this year. As in nature, microcomputer mice have both supporters and detractors, but almost everyone agrees that turtles are beneficial beasts—on the screen as well as in the stream.

The main role that computerized turtles play these days is in the Logo language, a language that has journeyed from the Artificial Intelligence Lab at MIT where it was developed to the classrooms of the world in just a few years.

The main difference between Logo and other languages is that Logo is intended to encourage learning by using the power of the computer, rather than being designed for writing programs. The child learns what a computer can do while working with familiar concepts from the world around him. The language demonstrates concepts by ignoring them and allowing the user to cause results immediately and understand them later.

The original Logo work done at MIT has evolved, through use, into an effective core language. Two main categories of enhancements, sprites and advanced programming features, distinguish the various current versions of the language from one another.

Since Papert's work was financed with NSF grant money, early versions can be licensed through MIT. Most of the advanced versions of Logo have been developed by Papert's associates at Logo Computer Systems, Inc. (LCSI). Let's have a look at some of the enhancements that have been added by this and other companies.

Sprites and Demons

A sprite is very much like one of Stephen Speilberg's Gremlins. It is something to which you give the initial impetus and which then continues on its own. Fortunately, you can interrupt it from time to time to give it new instructions.

Sprites add to Logo the ability to set events in action and watch the results. The child can define a rule or a series of rules and then sit back and watch them at work.

A demon is an "event" or action that is triggered by a timer, an input device (such as a joystick or paddle), or the collision of two sprites. An example is a procedure in which two trucks travel back and forth across the screen. A cat runs on a path perpendicular to the path of the trucks, and when either truck collides with the cat (don't worry, the cat never seems the worse for the wear), it meows loudly. The trucks and cat are sprites, and the cat's voice is a demon triggered by the collision of the sprites.

Logos that offer sprites are all based on a specific graphic chip, the TI 9918/9928 which was developed by Texas Instruments just for Logo. Therefore, sprites are found only in Logos for the Apple with an add-on sprite board and the Coleco Adam and TI 99/4A which have sprite hardware built in. There is no reason that a sprite Logo could not be developed for a high powered machine like the IBM PC or PCjr, but as yet no one has done it.

Advanced Programming Features

The advanced programming features offered by some versions of Logo can bring the language into the realm of Artificial Intelligence programming previously dominated by Lisp. As a replacement for Lisp, Logo has some advantages because of its clearer syntax

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and better support environment.

In addition to the standard list processing features of Logo, Digital Research's Dr. Logo and LCSI's Logo offer good string and variable manipulation capabilities. So far, however, Logo has been used mainly in the lower grades and the real power of these capabilities has been lost on most of the teachers using it. While the physical connection of turtles and sprites is clear, the list processing power of Logo seems to be obscure to many users.

Features to Compare

The basic feature of all Logos is the turtle. In addition, some Logos offer multiple turtles, either as static objects or as sprites. All Logos allow you to change the color of the turtle and its track, and some even allow you to change the shape of the critter.

The programming features of all Logos are based on a procedure called the TO, as in TO SQUARE—to draw a square. The basic language features are loops (REPEAT) and tests (IF). As a Logo becomes more advanced, variables are added using MAKE and then lists with such operators as FIRST, BUTFIRST (all but first), LAST, and BUTLAST. And since lists can contain both words and sublists, the concept of a sentence—a simple list of only words—can be introduced.

The real power of any language is demonstrated in the way it interacts with the machine on which it is running. For Logo, this interaction starts with the color screen and extends to the keyboard and other input devices. The ability to save and print procedures is a requirement for any serious use. Unfortunately, most Logos lack the ability to print the graphic screen.

The other important feature to consider in assessing the sophistication of a Logo is disk operation. Complexity of disk function ranges from simple text "stream" files to full file system access.

The Reviews

In trying to order the following collection of product reviews, I settled on the price of the hardware system as an impartial order that would be of at least casual interest to most users. The result is a mixture of descriptions of Logos of different levels and ages, and should be read accordingly.

TRS-80 Color Logo

As the lowest priced system for which Logo is available, the 16K TRS-80 Color Computer 2, is of more than passing interest to many schools. The cartridge version of Logo for this machine is the basis for a full education-oriented teaching system which includes student, teacher, and parent manuals and a full set of transparencies for use in the classroom.

The package concentrates on the turtle graphics functions of Logo with a couple of interesting twists. Because it is intended for a very small machine and beginning educational use, the package provides a good set of turtle manipulation functions. Going far beyond the single turtle provided by most of its competitors, this Logo offers the sprite-like ability to define up to 255 turtles, each of which can have a different shape and be controlled independently.

The Teacher's Package offered by Tandy may be a cost-effective solution for schools that want the convenience of disk access for multiple computers.

An additional feature, which is clearly aimed at very young users, is the doodle mode. In this mode, the child can control the turtle with single keystrokes. The resulting picture can be captured as a Logo procedure and then edited as the child's familiarity with the language increases.

Commands in Color Computer Logo are limited to those that control the motion of the turtle complemented by SEND, MAIL, NEAR, and ME to control multiple turtles. The SHAPE command sets the shape of the turtle.

Users who have peripherals will be glad to note that this Logo reads the paddles and allows procedures (but not graphics) to be printed.

The language as implemented by Tandy has a few minor oddities, the most significant of which is the use of parentheses instead of square brackets in statement lists. This change was made in deference to the Color Computer keyboard, which has no brackets, but it detracts somewhat from the ability to generalize Logo concepts from one system to another.

The language is well complemented with manuals for the student and the teacher. Particularly notable are the Color Logo Guide for Teachers, Book One, and The Color Logo Guide for Parents, Book One. Both books are co-authored by computer education pioneer Bob Albrecht and offer excellent step-by-step pictorial lessons.

Disk Version

The only difference between the cartridge and disk versions of Color Computer Logo is that using the disk is far easier than loading and storing procedures from and to audio tape.

The only drawback to the disk version is that the disk operating system occupies a great deal of memory, so the language cannot be used on a 16K system. The addition of the extended memory option and disk drive changes the nature of the system, removing it from the realm of truly low cost computing.

A boon to users of the larger 64K Color Computer II would be an advanced version of Logo that has been hinted at by Tandy. Some Tandy watchers speculate that the new version will work with the company's recently released color printers—a delightful thought.

Teacher's Package

The Teacher's Package offered by Tandy may be a cost-effective solution for schools that want the convenience of disk access for multiple computers. The Package is actually a system which uses the Radio Shack Network 2 Controller to connect up to 16 16K Color Computers to one disk drive.

Also included in the package are a teacher's manual, overhead transparencies, and individual student handbooks.

This is a very impressive package, and if the Logo it supported were just a bit more sophisticated, I believe it would capture the hearts of teachers on all levels. As it is, it does an excellent job of supporting the first level Logo class, but falls short for more advanced users.

Coleco Adam

Smart Logo for the Coleco Adam is one of the latest versions of Logo from LCSI and benefits from all this venerable organization has learned about building and packaging Logo systems. It comes on an Adam tape cartridge and begins with a very complete interactive tutorial. The tape also includes demo programs and tools for advanced users.

Smart Logo benefits from an accident of fate which makes it one of the best Logos I have seen. The basic

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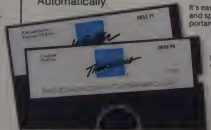

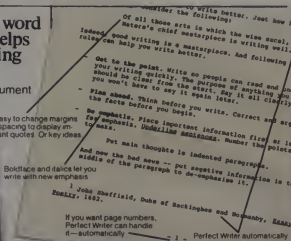
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ColecoVision game machine upon which the Adam is based, uses the TI 9918 graphics chip described above, and just as this chip gives ColecoVision games a great deal of extra pizzazz, so it adds a whole new dimension to the Logo language, including sprites and demons.

Smart Logo is a full implementation of Logo with all of the functions described in the introductory section of this article. Its only faults can be attributed to the fact that the Adam is a 64K Z80 system that suffers from the basic memory and speed limitations of an 8-bit processor, limitations that will escape the notice of all but the most ardent and advanced programmer.

For graphics and sound, this Logo offers support of the Adam game controllers and a set of functions to control the four-channel sound generator built in to the computer. Procedures and graphics can be saved, but only procedures can be printed on the character printer.

The Coleco system uses tape cartridges for storage, and although it does take two minutes to get the system up and running, the matter turns out to be of little concern because the tape is accessed only rarely. My only real complaint about the tape system is that the command SAVE can not be used to replace an old file nor to create a backup.

The various Apple versions of the language have been the driving force behind the widespread acceptance of Logo in the educational community.

In my test situation, this meant that children had to be taught about backup filenames and deletion of old files, a process that lead to lost files and some tears before it was understood.

The disk drive, which Coleco has promised for the fourth quarter of 1984, will support all the functions now available with the tape drive at considerably improved speed.

The manual is a small format looseleaf binder. It includes a tutorial section and a reference section that provides detailed examples and a good index. At the back of the manual are a reference card and an errata sheet.

Apple II+, IIe, and IIc

Even though the original work on Logo for microcomputers was done on the TI 99/4A, the various Apple versions of the language have been the driving force behind the widespread acceptance of Logo in the educational community. Logo was first implemented on the Apple through an NSF grant at MIT, and MIT has since licensed the software and manual to two suppliers, Terrapin and Krell. Both companies offer basically the same Logo with vastly different levels of documentation and

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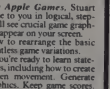

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support for their customers.

In addition, the version of Logo developed by LCSI for the Apple and Atari computers has been adopted as the official Apple version and has been enhanced, resulting in two more versions—one with an add-on hardware board for sprites.

MIT Logo

MIT Logo is a combination of turtle graphics functions and list processing functions. The turtle uses an Apple shape table and so may be changed by more sophisticated users.

Other features of the Apple that lend themselves to Logo are the Apple graphics screen which offers six colors and a nice work area for the turtle, and the disk drive which can be used to save procedures and pictures, either of which can be printed in black and white.

The MIT version of Logo has a full set of statements for turtle graphics and procedure writing. There are also list and sentence processing operations and the ability to add assembler primitives.

The screen editor works smoothly except for the problem of square brackets for enclosing lists on older computers. Like the Color Computer, the Apple II and II+ lack brackets on the keyboard, and to get them on the screen, you must press Shift-N and Shift-M, which can be a bit awkward. The problem does not exist on the Apple IIe and IIc, both of which have square brackets on the keyboard.

You can interact with MIT Logo procedures by using primitives for either the keyboard or the game paddles.

Utilities included with MIT Logo package is a wall chart that is useful for experienced programmers but can be confusing for the beginner.

The introduction of the language is handled in a disk called Alice in LogoLand. The package is a good introduction, but has some awkward features that make it less effective. The documentation itself is a reprint of the original MIT technical manual and is a bit of a hodge-podge.

In sum, the Krell package is reminiscent of the state of the art in 1981 when it was first released. The intention is good, but it comes off poorly. The main advantage of this package is the backup copy of the boot disk that comes with the original.

Terrapin Logo

The Terrapin version of MIT Logo is a considerably more advanced product than the Krell version. Terrapin has enhanced both the usefulness and the friendliness of MIT Logo with a complete user tutorial and two unusual peripherals for its language.

The first peripheral, the Terrapin robot turtle, is a mechanical turtle that can be controlled using Logo commands just as the graphic turtle can. It is fascinating to experiment with a three-dimensional object under program control. Unfortunately, the $300 price tag tends to keep the turtle out of the hands of most children.

The second peripheral offered in conjunction with Terrapin Logo is the Micro Mint Sprite Board, the first attempt to make sprite graphics available on the Apple. While the attempt is less than completely successful, it does demonstrate what can be done with sprites on the Apple. The main problem with the system is that it requires two monitors—one for the video from the Apple and one for the video from the sprite graphics processor. For the hobbyist or experimenter, the product is challenging and fun to use; for the classroom, it is just doesn't make it.

Terrapin has enhanced both the usefulness and the friendliness of MIT Logo with a complete user tutorial and two unusual peripherals for its language.

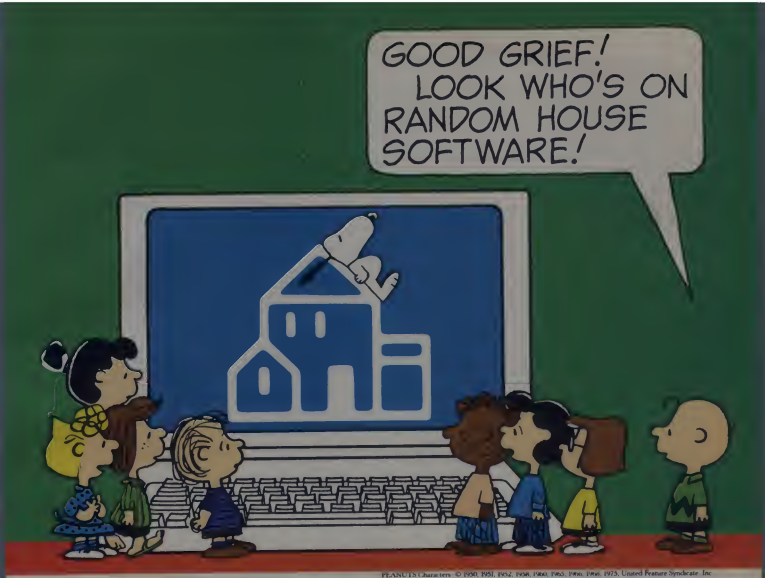
Krell Logo

Krell Logo is the original MIT Logo with some interesting but not very significant additions. Included in the can aid the beginning programmer with examples and provide the advanced programmer with an assembler that saves 6502 machine code directly. The exact set of utilities varies with the supplier; however, both include the assembler and sample programs like Rocket, the game of Animal, a single key doodle mode called Instant, the music interface to the Apple speaker, and a general file utility.

Apple Logos from LCSI

Apple Logo—The Original

The LCSI Logo that became the official Logo for the Apple is a smoother language than either of the two versions



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of MIT Logo. The package comes with a reference manual and a tutorial that are as good as or better than the best parts of both the Terrapin and Krell versions.

The LCSI language lacks some of the more interesting features of the MIT version, including the ability to save pictures to disk, and call assembler routines. Also lacking is the utility disk. These are all features that are of use primarily to the advanced user.

On the other hand, LCSI has added some features that will be welcomed by users who plan to write lessons in the language. These include cleaner syntax for logical operators like AND/OR, packages and buried packages, property lists, and error THROWing and CATCHing.

Apple Logo II

Logo is not a static or stagnant language, and LCSI continues to enhance and improve it. The latest official Apple Logo offers a revised set of manuals and a set of file operations (called primitives) that allow it to be used with ProDOS on a 128K Apple IIe or IIc. The only problem I observed was that a system this large begins to tax the speed of the Apple disk drives when loading initially or using the disk heavily. With a hard disk, of course, this problem vanishes.

The new, improved Apple Logo from LCSI is excellent for beginners and more than adequate for advanced AI applications.

A second improved version of Logo from LCSI comes with a sprite board that can be used with the Apple II + and IIe. Since the language itself was designed to take advantage of the sprite board, all graphics and text appear on the same video display.

The package includes extensive examples that demonstrate how to control sprites and redefine the shapes of existing characters. The only function not provided by the TI 9918 chip on the add-on board is the use of demons. There are, however, similar functions that test for collisions between turtles and/or sprites.

IBM PC

As with every other category of software, the market presence of IBM has inspired a large assortment of Logo packages for that machine. The graphics capability of the PC ensures that all versions score well in that area. Much to my surprise, however, none of the available Logos for the IBM offers sprites, even though the 8088 processor can support them through software. Instead, the PC Logos have concentrated on advanced programming features.

IBM Logo

As the official IBM Logo, this LCSI package is matched only by its sister product for the Apple. It features both a complete manual with reference and tutorial sections and the most complete language available.

As mentioned above, this Logo lacks sprites, but its full file system access makes it the implementation of choice for advanced users in both AI and teaching situations. For beginning users, the only drawback—and it is a small one—is the depth of the supplied example material.

The language is all there; it is hard to say more without being repetitious. All the turtle graphics commands are supported as are the programming and list processing features. Graphics are supported by the standard IBM hardware without low level access, and hackers will appreciate an assembler call facility that resembles Basic.

The only feature that advanced programmers will miss is subdirectory support, a lack attributable to the fact that IBM Logo is not yet available in a DOS 2.0 version.

Despite the fact that it is an official IBM product, I had difficulty obtaining a copy of IBM Logo. So if your local store denies all knowledge of the product, persevere; it does exist and is well worth the effort once you find it.

PC Logo

PC Logo from Harvard Associates is a good version of a turtle graphics Logo with all the extended features needed for advanced programming. The package makes good use of the PC function keys and is well adapted for the IBM machine.

Extra primitives allow for very simple and complete control over the PC screen and other hardware devices. Again, hackers will appreciate direct access to PC DOS and the BIOS ROM as well as many other low level features. The only thing missing is an assembler call.

At the same time, PC Logo can be used with ease by a child or relatively inexperienced grade school teacher.

The manual has an easy to read tutorial and a complete reference section packed in an IBM-sized binder. A good set of examples is included on the disk, and a reference card completes the package.

Harvard Associates offers a complete Logo package to schools, which includes a volume licensing plan and price incentive.

PC Logo from Harvard Associates is a good version of a turtle graphics Logo with all the extended features needed for advanced programming.

Not part of the package, but a peripheral that schools should consider buying is the Turtle Tot, a robot turtle that accepts its commands from PC Logo. Also available for the Apple, the device is a favorite among children of all ages.

Waterloo Logo

The University of Waterloo, long known for such favorites of computer science majors as the WatFor and WatFive fast Fortran compilers, has lately been working on a set of microcomputer tools, including a networking system and a language set to complement it. With this background, it is easy to understand the role of Waterloo Logo, an implementation that would probably not survive on its own.

The package is well done, but terse. It includes a reference card and a manual "written for people who already have programming experience using a high level language."

The language as implemented here is a good basic Logo system which is well adapted for the IBM PC, but as a competitive product it just cannot hold its own.

LadyBug Logo

One of the most impressive Logos for the PC is impressive not because of its fancy packaging or its great manual or even its fantastic features. It has no packaging; its manual is only fair; and its features are complete, but not fantastic. No, the package is impressive because of its price; it is free.

LadyBug Logo is freeware, and unfortunately, while people seem willing to pay $35 for a copy of PC-Talk, PC-Write, or PC-File, they are reluctant to pay for an educational package. Dave Smith, the author of LadyBug Logo, re-

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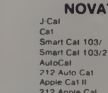

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quested that users make a donation toward further development work. Sadly, he reports that barely 1% of the 500 people to whom he has sent copies have sent him any money. I promised him I would challenge the readers of *Creative Computing* to prove that educational freeware can pay. Copies are available from the Young People's Logo Association and on many PC bulletin boards.

As for the language, itself, it is a full turtle graphics language with disk procedure storage and a good set of examples. The 84-page manual is on disk and includes a good index.

Special features of this version of Logo are a PLAY function for music, access to joysticks, and a full screen procedure editor. Running under DOS 2.0, the language allows graphics screens to be printed and just fits on the PCjr.

For advanced users, there is a good debugging mode, but the package is slow—about half as fast as most of the other PC Logos—even though it is written in compiled Basic.

Logo for Other Computers

In addition to the products discussed above, there are also Logos for the TI 99/4A, Commodore 64, and Atari computers. Computers for which versions of Logo will soon be released include the DEC Professional, Macintosh, Sanyo MB550, and TI Professional.

Logo for the Future

I predict that we will continue to see enhanced and improved versions of Logo. Most will come from LCSI, which has established itself as the main supplier of the language and has used its relationship with Seymour Papert to enhance the language and encourage educational programs to use it.

I have even seen some evidence that disk versions of Logo are being aimed at a wider audience than just the parents, teachers, and children who make up the education market. It should be interesting to watch the language at work in AI applications that have heretofore been the province of Lisp, a language that is much more difficult to use and understand. Who knows? We may yet see business applications done in Logo.

Logo is definitely one of today's most popular languages for use in computer education—and rightly so. It is a language that allows the child's (and adult's) natural ingenuity to trigger learning without effort. What could better educational tool could there be? ■

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User's Groups and Journals

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Box 1317
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Friends of Lisp, Logo and Kids
436 Arballo Dr.
San Francisco, CA 94231

Logo and Education Computing Journal
Krell Software Co.
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Stony Brook, NY 11790

Logophile
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(This group is associated with Papert.)

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The PC.3 features a built-in touch tone telephone with 13 programmable keys to store telephone numbers. It also includes a built-in 300 baud modem for simultaneous voice and data communications. The PC.3 carries a suggested retail price of $2595.

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ISM has released the Express PC and Express XT, two IBM PC compatible portable microcomputers using a 16-bit 8088 microprocessor. Both contain a built-in 9" color monitor, color graphics board, nine expansion slots, two serial ports, and one parallel port.

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The Express PC carries a suggested retail price of $3195. The Express XT sells for $4695.

ISM
Suite 6, 932
Hungerford Dr.
Rockville, MD
20850
(301) 279-5775

CIRCLE **431** ON READER SERVICE CARD

IBM PC Compatible Computers from Corona

Corona Data Systems has introduced two IBM PC compatible computers and a PC compatible laser printer.

The Personal Best PB400 uses a 16-bit Intel 8088 microprocessor operating at 4.77 MHz, includes 512K RAM on the motherboard, and runs either MS-DOS or Concurrent CP/M. It comes with two half-height 360K 5.25" floppy disk drives, a 10Mb Winchester hard disk drive, an 83-key detachable keyboard, and a 12" green monochrome monitor with 640 pixel x 400 pixel graphics resolution. The PB400 includes an RS-232C serial port and a Centronics parallel port and has four expansion slots. Corona bundles GW Basic, *PC Tutor*, and the *MultiMate* word processor with the PB 400. The suggested retail price is $5995.

Corona has also introduced the Mega PC, a multi-user multi-tasking unit that supports up to eight PB400s or workstations. It contains an 8088 microprocessor; 256K RAM expandable to 512K; choice of a 10, 20, or 40Mb Winchester; and 11 expansion slots. Up to eight Applications Processor Cards (APC), each holding 8088-2 microprocessors operating at 8 MHz and 256K RAM expandable to 512K, and connected to a PB400 or workstation, may be inserted into the unit. The Mega PC with 512K RAM and 10Mb Winchester sells for $7805. A workstation with APC retails for $1495.

Corona also has released a laser printer that can produce up to eight pages per minute, which is about 350 cps. It handles letter and legal sized paper, supports four type fonts and type sizes from seven to 20 points, and graphics output can be magnified up to four times the original size. The Laser Printer sells for $3395.

Corona Data Systems Inc.
275 E. Hillcrest Dr.
Thousand Oaks, CA
91360
(805) 495-5800

CIRCLE **432** ON READER SERVICE CARD

IBM PC Compatibles from ADDS

Applied Digital Data Systems, a subsidiary of NCR, has unveiled the PC/I and PC/II, IBM PC compatible microcomputers built around a 16-bit 8088 microprocessor. Both contain 256K RAM expandable to 640K, one 360K half-height 5.25" floppy disk drive, a detachable keyboard, one serial port, one parallel port, and video interfaces for monochrome, composite color, and RGB color monitors.

The PC/I has a second floppy drive while the PC/II has a 10-Mb Winchester. Both accept the 8087 numeric co-processor, have five expansion slots, and are bundled with MS-DOS 2.11 and GW Basic. ADDS offers six foreign language versions of MS-DOS.

The PC/I without monitor sells for $2445. The PC/II without monitor retails for $3995.

Applied Digital Data Systems Inc.
100 Marcus Blvd.
Hauppauge, NY 11788
(516) 231-5400

CIRCLE **433** ON READER SERVICE CARD

Hard Disk for Apple Line

Quark has introduced the QC10, a 10Mb hard disk drive for the Apple IIe, IIc, III, and Macintosh. The QC10 plugs directly into the floppy port on the IIc, IIe with DuoDisk Drive, and Macintosh. Special accessory cables are needed for the IIe without DuoDisk and the III. The QC10 retails for $1995.

Quark Inc.
2525 W. Evans, Suite 220
Denver, CO 80219
(303) 934-2211

CIRCLE **434** ON READER SERVICE CARD

New PC, PCjr Products from Tecmar

Tecmar has introduced an add-on 360K, 5.25" floppy disk drive and a 5Mb removable hard disk drive for the IBM PCjr. The cabinets are placed on top of the PCjr system unit and can support a monitor. The floppy drive carries a suggested retail price of $500. The hard disk drive price has not been set.

Tecmar has also released Graphics Tender, a color graphics board for the IBM PC. The Graphics Tender displays 320 pixel x 200 pixel resolution and includes a parallel port. The Graphics Tender retails for $299.

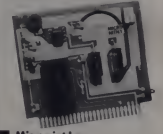
Tecmar Inc.
6225 Cochran Rd.
Solon, OH 44139
(216) 349-0600

CIRCLE **435** ON READER SERVICE CARD

Speech Synthesizer from Micromint

Micromint has introduced Sweet Talker II, a speech synthesizer for the Apple II+ and IIe. Sweet Talker II features 256 phoneme equivalents, 4096 pitch variations, and 16 speed settings. It also contains a 1 watt amplifier and volume controls.

Micromint claims Sweet Talker II reproduces French, Spanish, German, Russian, and English. It retails for $104.



Micromint Inc.
561 Willow Ave.
Cedarhurst, NY 11516
(516) 374-6793

CIRCLE **436** ON READER SERVICE CARD

Communications Controller from Tandy

Tandy has released the T-176, an SNA/SDLC protocol converter that allows TRS-80 Model 4, 4P, 12, and the Tandy 2000 to communicate with IBM host computers. The T-176 appears as a 3276 and the TRS-80 computers are used as 3278s. When combined with a VT-100 emulation program, the T-176 provides 3270 capabilities.

T-176 prices start at $1870.

Tandy Corp.
One Tandy Center
Fort Worth, TX 76102
(817) 390-3700

CIRCLE **437** ON READER SERVICE CARD

/ OH NO, NOT AGAIN. /

SON of ARCHON.

Jon Freeman, Paul Reiche III and Anne Westfall created Archon, the 1983 "Game of the Year" according to Softline and Creative Computing. Recent evidence, however, indicates they were not satisfied with this.

If you took all the hours spent by all the people who've played Archon and put them together, there's a good chance it'd amount to more human effort than it took to put a man on the moon.

The Archon Dragon

What does this mean? Is it a good thing? And why, in light of this, did the people pictured here decide to issue a scorching sequel named *Archon II: ADEPT*?

For starters, we don't really know what it means. Except that a lot of people who had a pretty good time with *Archon* are about to get more of what they like. And people who've yet to experience the best-selling, award-winning, knuckle-whitening original have *two* good things coming their way.

The Archon Basilisk

Point two: If there's a moral issue here, we see it this way: A wise man once said, "I ain't never had too much fun." We agree. And we think that once you get your hands on *Archon II: ADEPT*, you'll see his point.

Now for the third question. Why a sequel? Well, there are sequels and there are sequels. The good ones happen because people just haven't had enough of a good thing. Obviously we're here to tell you that *Archon II: ADEPT* falls into the right category.

The ADEPT Camera

Where Archon took inspiration from chess, fantasy role-playing characters and arcade combat, *ADEPT* comes more from a world of its own making. Like *Archon*, it pits the forces of good against those of evil. But in place of the chessboard motif there is a map of elements—Earth, Air, Fire and Water. The role of magic is greater. The strategies are deeper. Things move faster. And the hidden algorithms that control the computer's play are considerably smarter.

The ADEPT Thunderbird

Having already spent the better part of a month playing *ADEPT* (in order to write this ad, of course), we're quite confident it will seduce you too.

And if, by some strange chance, there is a parallel universe in which computer simulations come to life, we are confident that a large part of its population has Jon Freeman, Paul Reiche III and Anne Westfall to thank for their brief and miserable existence.

ARCHON™ & ADEPT™

from ELECTRONIC ARTS™

MACHINE REQUIREMENTS: *Archon* is available on the Apple II, II+, IIe & IIc, IBM-PC, PCXT & PCjr, Commodore 64 and Atari. *Archon II: ADEPT* is available on the Commodore 64 and Atari.

Archon and Archon II: ADEPT are registered trademarks of Electronic Arts Inc. Atari is a trademark of Atari Computer Corp. Apple is a trademark of Apple Computer Corp. Commodore is a trademark of Commodore Business Machines Inc. IBM is a trademark of International Business Machines Inc. For a free product catalogue, send a stamped self-addressed #10 envelope to Electronic Arts, 2755 Campus Drive, San Mateo, CA 94403.

WHAT'S NEW IN SOFTWARE

Menu Program for IBM PC

DeereSoft has introduced *Magic Menu*, a control program that lets users switch between applications without using DOS. *Magic Menu* also allows passwords to be designated for any or all menu selections, screen blanking, and automatic execution of a series of menu entries. It sells for $103.

DeereSoft Inc.
P.O. Box 1360
Melbourne, FL 32901
(305) 768-2477.
CIRCLE **442** ON READER SERVICE CARD

Tandy 2000 Software

Three software packages, *Lotus 1-2-3, PC Maker*, and *Open Access*, have been made available for the Tandy 2000 microcomputer.

Lotus 1-2-3, a combination spreadsheet and graphics program, is packaged with PrintGraph, a utility program for printing graphs. *Lotus 1-2-3* also comes with MS-DOS already on disk, so users can run the program without going through an installation procedure. The package retails for $495.

PC Maker is a utility program to help exchange data between the Tandy 2000 and other MS-DOS or PC-DOS based computers, for example, exchanging *Lotus 1-2-3* files between a Tandy 2000 and an IBM PC. *PC Maker* is available free of charge to owners of the Tandy 2000.

Open Access, an integrated package with word processing, spreadsheet, graphics, communications, time management, and database management modules, makes extensive use of windows. It sells for $595.

Tandy Corp.
1800 One Tandy Center
Fort Worth, TX 76102
(817) 390-3700
CIRCLE **443** ON READER SERVICE CARD

Payroll For TRS-80

The Alternate Source has introduced *Tinypay*, a payroll package for companies with 20 or fewer employees. It includes a report generator and runs on TRS-80 Model I, III, 4, and the Tandy 2000. Tinypay sells for $20.

Tasmon4 is a programming utility to check memory locations and Z80 registers; run machine language programs in real time, single stepped, and slow motion; and create up to nine program breakpoints. It also includes a disassembler that generates Z80 source code. *Tasmon4* retails for $29.95.

The Alternate Source
704 N. Pennsylvania
Lansing, MI 48906
(517) 482-8270
CIRCLE **444** ON READER SERVICE CARD

Tax Preparation for TRS-80 Color Computer

Alpha Byte has released *Taxaid*, a tax preparation program that includes the 1040 form and Federal schedules A, B, C, E, F, G, and Child and Dependent Care. It includes tax law changes for 1984. The package sells for $21.45 on cassette and $26.45 on disk.

Alpha Byte
1008 Alton Circle
Florence, SC 29501
(803) 662-9500.
CIRCLE **445** ON READER SERVICE CARD

Integrated Software from Noumenon

Noumenon has introduced *Intuit*, an integrated software package with word processing, database management, electronic filing, financial modeling, calculator, and clock modules that runs on an IBM PC with 256K RAM and two double sided disk drives. The retail price of *Intuit* is about $330.

Noumenon Corp.
512 Westline Dr.
Alameda, CA 94501
(415) 521-2145
CIRCLE **446** ON READER SERVICE CARD

Smartcom II Enhancements

Hayes Microcomputer Products has released *Smartcom II 2.0*, an upgrade to its telecommunications software that includes Xmodem protocol, VT 52 and VT 102/100 terminal emulation, and batch commands for automatic data transmissions at specified times. *Smartcom II 2.0* also protects passwords, performs off-line modem tests, and switches between voice and data transmission.

Smartcom II 2.0 requires 128K and is available for the IBM PC, TI Professional, Wang PC, HP 150, and Dec Rainbow 100. It retails for $149.

Hayes Microcomputer Products Inc.
5923 Peachtree
Industrial Blvd.
Norcross, GA 30092
(404) 449-8791.
CIRCLE **447** ON READER SERVICE CARD

Apple Utilities

Blash has introduced *Screen Format+* and *Menu Maker+*, two utilities programs using Applesoft Basic on an Apple II, II+, or IIe.

Screen Format+ is a screen generator that automatically centers text, provides proportional spacing, and writes the appropriate lines of code into a program. *Menu Maker+* takes headings and creates a menu framework and program code.

Screen Format+ and *Menu Maker+* are sold together on one disk for $31.95.

Blash Inc.
3612 Pandola Ave.
Joliet, IL 60435
(815) 725-3324
CIRCLE **448** ON READER SERVICE CARD

CIRCLE 187 ON READER SERVICE CARD →

"Academic Excellence is a 24-Hour Challenge"

—Herb A. Sang, Superintendent
Duval County Public Schools

A Report on After-Hours Learning
in Jacksonville, Florida

Duval County, Florida educators support their award-winning students with an around-the-clock commitment to education.

Teachers and administrators in Duval County, Florida use rigorous academic standards during the day and a generous supply of help after school to make their students some of the best-educated in the entire nation.

Now school administrators have taken another important step by adding a fully equipped computer lab, open 24 hours a day for students and teachers.

At the lab, students can complete homework, develop their computer programming techniques or meet with friends to work on class projects. Teachers use the computer lab to prepare their courses, develop computer-aided lessons and grade school work. Duval County uses Radio Shack Color Computers in elementary schools and TRS-80® Model 4 computers in secondary schools. To accommodate students and teachers at all levels, the new computer lab was designed with 16 of each model.

And while teachers and students use the computers to improve scholastic performance, the computers are also being used to lay the groundwork for a generation of computer-literate business and trades people in Florida.

Duval County's new computer lab is an important part of the district's innovative system of education.

Preparing students for the future meant first recognizing the skills the students will need. Superintendent Herb Sang and board members of Duval County Public Schools made computer education a primary goal for students in all grades.

Duval County clearly saw the importance of the computer in our daily lives when it chose to bring computer-based learning into its classrooms. Now, with the addition of the district's computer lab, students are receiving an even greater educational head start.

The educators in Duval County chose Radio Shack computers and equipment for their classrooms. Radio Shack provided them with the quality they demanded, a full line of support services and prices they could afford.

Board Chairman Wendell Holmes and Superintendent Herb Sang see computers as a top priority in education.

Students at Duval County's secondary schools prepare for the information age using TRS-80 Model 4 computers.

Elementary school students are introduced to the Color LOGO programming language on Radio Shack Color Computers.

The district's computer lab also provides teachers with room to work, study and prepare class materials.

stions about homework call "Homework Hotline" . . . Where teachers are ready to help in almost any subject area.

Radio Shack can supply computers for a classroom or a school system.

Whether you're looking for one computer for a classroom or for educational equipment for a school system, Radio Shack has the experience and technology you need.

Our Color Computer 2 and Model 4 are ideal computers for the classroom. They can be used individually or as a shared system tied to a teacher's "host" computer with one of our network controllers. Each model is supported by a full line of accessories and software, including educational courseware to supplement instruction in math, science, history, reading, language arts and computer literacy.

Radio Shack also offers the Courseware Preview Library, a sampling of our carefully selected educational software for you to review and try at every Radio Shack Computer Center. And only Radio Shack offers educators a full-time educational consultant, trained to help you bring computers into the classroom.

For more information on Radio Shack educational products and services, contact your Regional Educational Coordinator. For the name of the Educational Coordinator near you, call Radio Shack's Education Division toll free at 800-433-5682. In Texas, call 800-772-8538.

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A Determination to Improve Education

Duval County school administrators can measure the success of their new programs against the system's very recent history. As few as eight years ago, the schools that now produce National Merit Scholars were plagued with behavior problems and low scores on national standardized tests.

But in 1976, administrators moved to stop the decline in scores with new policies emphasizing academic achievement and high disciplinary standards. A "Learn to Learn" program taught students the fundamentals of good study skills and work habits. Educators, citing the need to prepare students for a world dependent upon computers, brought computer-based instruction into their primary and secondary schools.

To encourage students to keep their books open after school hours, the school district offers homework assistance programs in more than 50 schools. Four nights a week, students can call a "Homework Hotline" to get help in reading, English, spelling, math, science and history. And, in a unique blend of television and education, three local TV programs challenge students to call in the correct answers to math, spelling and science problems.

The results of the increased emphasis on academics paid off for Duval County students. Performance in the State Student Assessment Test raised the district's average from 56th of 67 districts to first in both communications and mathematics among Florida's large urban districts. Black students' performance on the same tests has increased an average of 295 percent in math and 43 percent in communications since 1977.

Improvements show in other areas as well. The number of National Merit Scholarship semifinalists has increased 73% in just two years; the number of students entering colleges is up. Students' scores in the nationally normed Stanford Achievement Test show district students surpassing the national average in almost every area. And, after a search requested by the U.S. Department of Education in 1982, Duval County Public Schools were selected as a national model urban school district.

Duval County has won three of four N tional Academic Super Bowl champi ships.

The computer lab is ideal for in-serv training.

Computers are also used in classroom instruction and allow individually paced work.

Students with que

Enter The Movits

There is a growing interest in robotics, and some wags are saying that personal robots, today, are at approximately the same stage of development that personal computers were eight or nine years ago. That may be true. Certainly, the robots now available to experimenters—Heath's Hero, the RB5X, Androbot's Topo and Bob, and several manipulator "arms"—are about as expensive as the first microcomputers were—and about as useful. (That is to say "very" and "not very.")

It doesn't take thousands of dollars to acquaint yourself with some of the principles of robotics, though. A new series of robot hobby kits is now being imported from, you probably guessed, Japan, where the robot has achieved something of the status of cultural hero. These models, called Movits (pronounced "Move its") stand to introduce American technology buffs to a new hobby.

Fifteen Movits kits are available in Japan, and ten of these are now being distributed by OWI, Inc., a California importer, with more promised for the near future. The models range from simple, but unique, mechanical movements—mainly walkers and wheeled platforms—to programmable "turtles" and moving machines that sense their environments. The more complex models use microchips mounted on small printed circuit boards. All are battery powered and are built around plexiglass body parts and bases. They come in kits to assemble, and parts are meticulously labeled and packaged in tiny plastic bags.

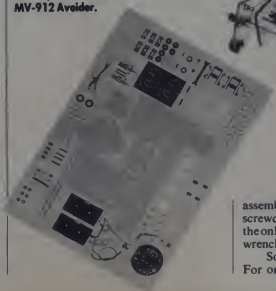
Best of all, the instruction sheets furnished make assembly very easy, although, because of their size, it clearly requires patience, dexterity, or small hands. The circuit boards are already assembled in the American versions. A screwdriver and needle nose pliers are the only tools needed; a miniature metric wrench is included with each kit.

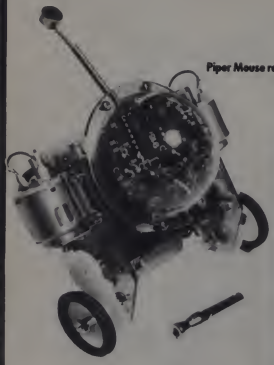
So what do the robots actually do? For one thing, they remind us that at

Model MV-919 Monkey swings on an overhead string.

Model MV-912 Avoider turns away from walls.

All the parts for the Model MV-912 Avoider.





Piper Mouse responds to a whistle.

Detail of the Piper Mouse drive mechanism.

Packaging is attractive and colorful.

Model MV-918 Memocon Crawler can be programmed to follow a set of instructions.

least half the importance of robot design is innovative mechanics. The Movits use several basic movements. Two models, the Sound Skipper and Skipper Mecha, walk on two widely-based legs in a skipping motion. (The Tsunawatari Monkey uses a variation on this design, but moves hand-over-hand on a string or wire.) The Movits named Piper Mouse and Peppy are built on tricycle, wheeled bases. The Memocon Crawler and Line Tracer II also ride on three wheels and are classical "turtles" by design. The Avoider and Turn Backer have the most unique movements, a very clever, six-legged design. In motion, these look like alien puppies as they scurry around and reverse directions. Another robot, Mr. Bootsman, uses a variation of this scheme.

Of course, without intelligence of some sort, these are just fascinating mechanical toys. A few of them, in fact, are only that. Skipper Mecha and Mr. Bootsman lack the circuitry that would make them true robots. Four others, the Monkey, Sound Skipper, Turn Backer and Piper Mouse have simple, sound-activated cycles. (A little condensor microphone hears the commands of hand clapping or a whistle.) Peppy has a microphone on a boom that can also detect a collision with a wall or object, then turns and continues on its way. The Avoider and Line Tracer II have infrared sensors. Avoider detects reflections from an onboard infrared diode and uses it to "see" if an object is in its path. Line Tracer does just that; using infrared light, it will follow a line drawn on a sheet of paper or a tape on the floor. (If only Lionel trains could do the same thing.)

The Memocon Crawler, the most sophisticated of the Movits, is probably the most interesting to computer users. Crawler can be programmed to go left, right, or straight ahead, to beep (via a miniature onboard speaker) or flash its LED headlight. As in the Logo programming language, each step represents a unit of time and, in this case, distance. This is a form of simple, sequential control, and only one other command—essentially a repeat or jump back to the beginning—is allowed. One very nice hardware feature is a touch-sensitive reset switch located on the bottom of the printed circuit board.

Crawler is programmed via a small keyboard furnished with the kit, which you assemble. (The "keys" are actually flexible plastic with conductive rubber contacts.) An attractive feature of this kit is that it can also be interfaced very simply to a small computer. (No mention of this is made in the instructions, however.) The keyboard can be replaced by a connection to any parallel data port. Only five data lines (bits) and common ground are used and programming can be accomplished through PEEKs and POKEs in Basic.

I have tried this and it works. A Commodore 64 or Vic-20 is ideal because of the "user ports," and a simple driver program can be written in as few as ten lines of Basic code. No electronics are required, and the only difficult part was finding a "header-type" connector to attach to the Crawler's keyboard port.

Two more Movits have been released in Japan. The Medusa is an

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All templates, except those for Kaypro and Osborne, are reversible. The reverse side contains additional commands or Do-It-Yourself blank lines

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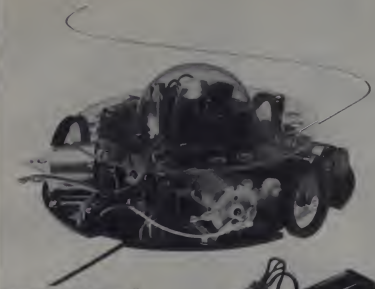

Model MV-913 Line Tracer II follows a line on the floor.

Completed Monohopper jumps toward a strong light source.

Partially assembled Bandai Monohopper. Directions are in Japanese but have many illustrations. Necessary tools include needle nose and diagonal cutting pliers, phillips head screwdriver, nut driver, and tweezers.

experiment with a new four-legged walking system and is reminiscent of the walking tanks in "Star Wars." The second, called Circular, is the first radio-controlled Movit. It uses a truly unique motion system based on drive wheels and concentric discs that is a bit too complex to describe here. It, too, could probably be interfaced to a microcomputer, but would require some additional electronics to do so. Circular requires FCC approval before it can be sold in the U.S. No decision has yet been made about introducing Medusa here.

Hisashi Kojima, the Movits' 31-year-old designer, isn't immune to the possibilities of linking his models to computers, and, in fact, promises some surprises in the near future. Hiro Okayama of OWI, Inc., has seen some of the forthcoming designs, but will yield only that they are "very impressive." One guess is that future designs could include a small arm or a robot that can be computer-controlled, yet responds to its environment. Having seen all the current designs, I can hardly wait.

The Movits are not inexpensive toys. They range from about $20 for the simplest to about $75 for the Memocon Crawler. Some mail order advertisements have appeared, and Hiro Okayama says that they are available through the chain of Heathkit stores. For further information, contact OWI, Inc., 1938-A Del Amo Boulevard, Torrance, CA 90501.

Robot building appears to be a growing hobby in Japan. There seems to be no reason why it couldn't catch on in the U.S. Kojima brought one of his "Micro Mouse" designs with him to the Winter Consumer Electronics Show, where the Movits were introduced. (There are "Micro Mouse" competitions in Japan, where hobbyists build moving platforms capable of learning and navigating through mazes.) Hobby robots are at least as satisfying as radio-controlled cars, boats, and airplanes, and are no more difficult to build. One can only dream of the possibilities. And, of course, it would be nice to see some competing designs originate in the United States.

One could question the real value of building toy or hobby robots. After all, the Movits will never fetch your pipe and slippers, do the house or yardwork, or function in any remotely practical way. Right now, they serve to educate about the technology which makes them possible. They might make nice little electronic housepets, the equivalent of a gerbil or hamster, or they could, in future designs, become clever watch dogs. Most important, however, is that they fulfill a real growing need for constructive play.

Long live the Movits!

Robotics Sourcebook

If you want more information about any kind of product in the field of robotics, get the *Robotics Age Product Guide.*

It has complete descriptions of products in 15 categories, including robot arms, turtles, voice I/O, play robots, and ultrasonic ranging.

The price is $9.95 postpaid from Robotics Age, 174 Concord St., Peterborough, NH 03458. ■

DAVID H. AHL

PEOPLE & PLACES OUTTAKES

"Outtake /n: an unused film take." There are showings of outtakes at sci fi conventions, film festivals and on TV. Well, we had a drawer full of pictures that just wouldn't fit in our Tenth Anniversary Issue (Nov. '84), so we decided to share some of them with you.

VideoBrain computer (1978) ran a version of APL.

One of the first Pets shown in public, second Atlantic City show, August 1977.

Ted Nelson, author of Computer Lib/Dream Machines and one-time editor of Creative Computing. June 1978.

Steve Gray when he was publishing the Amateur Computing Group Newsletter. 1976.

Scott Adams at the PC Expo in Chicago, October 1980.

In the 70's, many Dartmouth students wore jerseys with their user number and Keiwit Computation Center Symbol on the back.

Creative Computing expands and exhibits at CES, May 1981.

QUARK ANNOUNCES

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*If you do not have a Duodisk, or use an Apple III, a special cable is available. See your dealer for details.

**Catalyst works on the Apple IIc, IIe and Apple III. It is not compatible with Macintosh.

Photography by Barbara Kasten

CIRCLE 184 ON READER SERVICE CARD

RUSS LOCKWOOD

Choosing And Using A Word Processor

What Is A Word Processor?

When salespeople throw you a sales pitch about how a computer will increase productivity, cure tedium, and generally improve your life, they always mention word processing. Office or home, executive or student, these people claim that just about everyone can use a word processor. In general, they are right; word processing is a big reason why computers found a permanent niche in our homes, offices, and classrooms.

A word processor is made up of two parts, a *text editor* and a *text formatter*. A text editor lets you enter and change text on the screen. A text formatter lets you send the text to a peripheral device, like a printer, exactly as it will appear on the printer page.

The text editor has cursor control, which may be simply the cursor control keys, a more extensive and elaborate set of command codes, or both, to get you from one place to another in the text. Text editors are either *screen oriented*, which means one character on the screen represents one character in memory and changes are made instantaneously, or *line oriented*, which means entire lines of text are entered and stored in memory.

A word processor allows you to use your computer in much the same way you would a typewriter, with some important exceptions. With a typewriter, you see your deathless prose on paper immediately after you type it. With a word processor, your writing is stored electronically. Your link is through the monitor, where the words appear on screen, or the disk, where the words are stored for future use.

With a typewriter, altering your writing means retyping the page. Moving paragraphs around becomes an exercise in using scissors and tape to cut and paste. Not so with a word processing program. Since your prose is stored electronically, inserting, deleting, and moving text is as easy as pressing a few keys. Only after you are satisfied with your work do you print out your document on paper.

As a corollary to this, once you do decide to print out the text, you press a few keys and then sit back and watch the printer go—effortlessly, flawlessly, accurately churning out the words as fast as it can pull them out of memory or off the disk.

Finally, setting up special formats—headings or footers for example—on a typewriter is time consuming and must be repeated for each page. With many word processors, you set up these special layouts once and then watch the program automatically duplicate them on each page.

Indeed, a word processor is a versatile tool—far more versatile than a typewriter. Most writing that can be done on a typewriter can be done more efficiently on a word processor.

As you can imagine, anyone who writes—and that includes business people, students, editors, and just about everyone else—can take advantage of the speed and ease of a word processor. In the business world, memos, letters, and reports can be drafted, revised, and printed much faster with a word processor than with a typewriter. On the home front, students find that much of the tedium of revising and retyping term papers is eliminated. All in all, a word processor saves you time and effort and is a practical application for your computer investment.

How To Buy A Word Processor

Word processing is one of the biggest inducements to buying a computer. Without a doubt, manipulating words electronically on a monitor screen before committing them to paper is much easier than wrestling with a typewriter and its reams of paper, rolls of ribbon, and gallons of white-out. If you already use a word processor, you know the advantages of owning one, but you may want or need to consider a second one. If you have never used a word processing program, read on, and we'll show you what to look for.

Matchmaker, Matchmaker

Computers inspire dedication and loyalty to make and model just as automobiles do. For every user who will give up his Macintosh only after you pry it from his cold, lifeless fingers, you can find another who claims that the Mac is a fancy toy with no practical purpose.

Well, the same is true of word processors. *WordStar* fanatics abound, while devotees of other programs shake their heads in amazement. The real trick in picking a word processor is choosing the one that is right for you.

Plan Ahead

As you start to look for a word processing package, above all else, plan ahead. Sit down and figure out exactly what you want to use the word processor for. Slick marketing notwithstanding, some people just do not need an expensive, extensive, learning-intensive word processor. So why pay for features you will never use?

Analyze the kind of writing you do and think about how much and how often you write. In the office environment, a secretary who types scores of letters every week or an executive who produces company reports can use a powerful, full-featured word processor. On the other hand, an executive who writes brief memos and an occasional report or a high school student who writes a few term papers each year can get by with a less powerful word processor.

On the home front, most people need only a basic word processor for letter writing and club minutes. Students can use an intermediate level program that adds a few special features to the ba-

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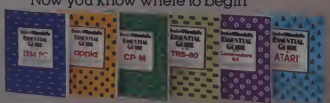

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Choosing And Using A Word Processor

sic editing and formatting functions. Freelance writers, consultants, and other professionals who work at home are better off with a full-featured word processor similiar to those used in an office environment.

Can We Talk?

Compatibility is another buzz word making the rounds in computer ads. Although it is usually associated with hardware rather than software, you should also consider compatibility when buying software.

On the most basic level, be sure that the word processor you are thinking about buying actually runs on your computer. At first, this may seem so obvious that it borders on the ridiculous, but, tales of people buying software that fails to run on their computers are not as rare as you might think. Some IBM PC compatibles are not as compatible as they pretend to be. Software that runs on an IBM PC may not run on a compatible. Be safe. Try the word processor on a computer like yours before you buy.

On a more sophisticated level, if you are one of the many people who bring home work from the office, a word processor that can use the same files at home and at work is a real bonus. At the very least, you should have a program to convert the files from your home word processor into files that can be read by the word processor at work. Some word processing packages include such a conversion utility program. Again, if you can, try before you buy. A simple test now can eliminate a great deal of frustration in the future.

First and Foremost

WordStar still leads the word processor pack in terms of number of units sold—due in part to its early appearance in 1979 and due also to its foresighted design, which includes a wide range of editing and formatting features.

Recognizing a good thing when they saw it, software manufacturers soon flooded the marketplace with new entries, each offering a different method of manipulating text. More than 100 word processors are currently available. The accompanying chart will help you select the one that best fits you needs.

Features and Functions

With so many word processors on the market and so many claims being made by the various manufacturers, it is easy to become confused about what features you need. Furthermore, the majority of computer stores usually stock only about a half dozen or so word processing packages, and most salespeople are familiar with only two or three of them. A computer chart of features is certainly helpful in narrowing down your selection, but understanding what the features do is a prerequisite to making good use of the chart.

Cursor Control

When we speak of *cursor control*, we mean the ability to move the cursor anywhere on the screen. Word processors almost always make use of cursor control keys if the computer has them. If a computer has no dedicated cursor control keys, then the word processing program controls cursor movement with a combination of a control or alternate key with a letter key.

There are several methods of moving forward and backward within the text. Just about every word processor allows for character and line movement, and many provide movement by word.

Other quick ways to navigate around a text file include cursor movement to the beginning or end of a file, to the beginning or end of a line, and to the previous or next screen. The more mobility you have within a text file, the faster you can invoke the editing functions as you revise your work.

Standard Editing Functions

We expect all word processing programs to perform certain necessary editing functions—insert, delete, search and replace, and block operations—so in the chart, we lumped all these features into one category: Standard Editing Functions. The chart mentions only those functions that are *missing* from the package. If a feature is not noted as missing, the word processor has it.

Delete

What the word processor prints, it can take away. The *delete* function erases characters. Again, if you can erase a character, you can erase a word, a line, or a paragraph. Most packages will let you delete from where the cursor is to the end of the line, although the more sophisticated the delete features are, the more keys you must press.

Insert

If you have ever left out a character or wanted to add a word to a sentence, you know how difficult (and unsightly) it is to make such corrections on the type-written page. The *insert* functions of a word processor make cleaning up these errors a breeze.

Generally, if you can insert a single character, you can insert a word, sentence, or paragraph. Some word processors start you out in insert mode while others require you to press a key to toggle the insert mode on and off. Note that when the insert mode is off, you replace characters rather than adding them in the middle of text.

Search and Replace

One of the niftiest features of a word processor is *search and replace*. What this does is find a particular string of characters and replace them with another string as your choice. For example, you could use wp throughout the text as you write the first draft of an article about word processing then, when the piece is done, you can use the search and replace feature to change all the wp abbreviations to word processor. Likewise, you can customize form letters by replacing all references to ABC, Inc. to XYZ Co. All in all this is a timesaving and useful feature.

Wildcard searching is an exotic search technique in which you enter the first and last letters of a word separated by a number of unknown characters, for example, p???a. The program searches for all five-letter words starting with P and ending with A. This feature can be useful if your spelling is inconsistent. Only the more powerful word processor include a wildcard search function.

Block Operations

Cutting and pasting paragraphs in the text is a snap with a word processor. A *block* is defined as all the characters between two marked points in the text. It may be a paragraph, a sentence, a character, or even a page or more. Most packages use the convention of marking the beginning and end of the block and then placing the cursor at the point to which you want the block moved.

In addition to moving the block from one location to another, you can delete a block of text or copy it to another location. The procedure is similar and can be very useful when it come time to revise a first or second draft.

Standard Formatting Functions

Just as we expect all word processors to include certain editing functions, so we expect them to include certain necessary formatting functions. As we mentioned earlier, formatting pertains to the way the text will appear on the printed page after being sent to a printer. Again, the chart notes only those features that are lacking in a given word processor.

Formatting breaks down into two concerns: space—margins, tabs, justification, centering, headers and footers, and line spacing—and form—

Choosing And Using A Word Processor

boldface, underlining, and super-and subscripts.

Space, the Final Frontier

Margins are pretty much self explanatory. The left, right, top, and bottom margins should be adjustable. For most applications, an 80-column width and 72-line length (legal size) are the minimum requirements.

Tabs, like the tabs on a typewriter, let you move across the page quickly, particularly at the beginning of paragraphs. They should also be adjustable.

Justification means lining up the ends of lines. If you look at this column of type, you notice that the ends are straight, which means the column has left and right justification. Most letters look better when the right margin is not justified. Newsletters and similar documents, on the other hand, appear more professional if the columns can be right and left justified. Word processors should allow you to toggle justification on and off.

Centering is a big help, especially for titles and subheadings. Basically, you should be able to center any line within the left and right margins. Changing margins should change the position of a centered line.

Headers are the bits of text that appear at the top of each page. *Footers* appear at the bottom of a page.

Line spacing refers to single, double, or triple spacing of text. You should be able to specify which you want for each document you produce. You might also want a way to change line spacing within a given document.

Matters of Form

Boldface, which is sometimes known as emphasized type, makes the text stand out. It can be used for headings or to emphasize words within the text. Some programs actually show boldface characters on the screen; others mark the beginning and end of boldface sections with special characters.

Most word processors handle *underlining* the same way they handle boldface. They may either show underlined characters, or mark the beginning and end of underlined text with special characters.

Superscripts, which are used in footnotes and mathematical formulae, and subscripts, which are used for mathematical and chemical notation, are other features that come in handy in reports and term papers. If you need them in the work you do, you are undoubtedly aware of it. Most word processors do not show actual super-and subscripts on the screen, but do mark them with special characters.

File Merge Capability

File merge capability represents the ability to combine separate text files on disk into one file on screen. This feature is especially helpful in creating standardized paragraphs and moving them into different documents.

On-Screen Help

All of these editing and formatting features come with a price: the learning curve. The more sophisticated the program, the longer it will probably take you to learn how to use it and, more important, to use it well.

Even word processing veterans forget a command from time to time, so most programs include a *help directory* on the screen to jog your memory. This way, with the press of a few keys, you can look at a quick summary of commands without having to pore through a thick manual.

Two types of help are available: *continuous*, in which a section of the screen is set aside for help messages, and *on demand*, in which the help message overwrites part of the screen when you call it up. Generally, you use the continuous help at first, and then use the on demand help for infrequently used functions after becoming familiar with the word processor.

Split Screen

In a sense, *split screen* is a form of windowing, in which you can edit two parts of a single file or parts of two different files on one screen. Only the more powerful word processors have this ability. For professional writers and executives who may need to pull information from many different files, a split screen feature can be a boon.

File size

File size is the maximum space allowed per text file. Many word processors use virtual storage, so the amount of space on the disk is the only limit to the length of the file. Others load in the program and use the amount of RAM left over in the machine for your file. This, clearly, limits the size of the file. However, most programs that function in this way can chain files together to allow longer documents.

Be warned, though, that there are programs—like the current version of *MacWrite*—that not only limit the size of your file, but prohibit chaining of files. If you write long documents, be sure that the word processor you choose can accommodate them easily.

Automatic Backup

Automatic backup is a handy feature that makes a backup copy of the file on which you are working. That way, if you lose a text file, the disk contains a duplicate, saving you much time, effort, and agony.

The only drawback of this feature is that the system may choose to back up your file at a moment that is not convenient for you. This is a minor inconvenience, however, and a small price to pay for the security of never having to start from scratch.

SWIG

SWIG, an acronym coined here and now, stands for See What I Get. This means that what you view on the screen is what is printed out on paper. Thus, centered lines are really centered, margins are accurate, and columns are columns.

As we said before, many programs do not actually display boldface, underlining, and super-and subscripts on the screen, but mark them with special characters. For the purposes of our chart, if a program displays these special characters on the screen, you do know what will appear, and hence it receives a positive SWIG.

Some programs, especially those limited to a 40-character line, offer a special preview mode so that you can see how your document will look before printing it out. This feature is especially helpful for letters and other documents that must be centered on the page.

Mail Merge Capability

We note if the word processor has *merge capabilities* with other files. Mail merging is very important to some people, especially those who want to pair their word processor with a database to prepare form letters or other personalized documents.

Embedded Printer Commands

Many word processors let you place special *formatting commands*, sometimes called dot commands, within the text file. This versatile feature lets you switch type fonts, page length, pitch, page numbering, and margins. This is especially helpful in integrating text with graphics or setting up different page layouts within one document.

Printer Support

Printer support refers to the process of making the word processor communicate with the printer. Most packages include an installation procedure, al-

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Choosing And Using A Word Processor

though some include a driver utility program geared to a particular printer.

Also, we have noticed that an increasing number of users are hooking up two printers to a single computer. A serial printer provides letter quality output, while a dot matrix printer is for fast draft quality output. If you intend to attach two printers at once, check to see if the word processor allows you to switch between them easily. Otherwise, you may end up going through the installation procedure every time you want to change printers.

Copy Protection

Finally, we note whether a program is *copy protected* or not. A copy protected program cannot be loaded onto a hard disk, nor can backup copies be made of it.

So, if you have a hard disk drive and want to be able to boot your word processor from it, look for a program that is not copy protected. If, however, you don't mind booting a copy protected program from a floppy disk each time you use it, you can store your text files on the hard disk.

In any case, you should have a backup copy of your program disk, for no matter how secure your files are, they will be of absolutely no use on the day someone FORMATs your program disk or the dog mistakes it for a frisbee. It may seem reasonable at the time of purchase to "return the defective disk along with $10" to the manufacturer to obtain a replacement, but at the moment it becomes necessary to do so, you will probably find *hara kiri* just as attractive.

Documentation

Of course, all word processors come with manuals—usually thick manuals—that describe the features of the software and how to use them. We certainly do not want to make broad generalizations, but it seems that the thicker the manual, the more features and options the program includes. And in general, too, we have noted a trend toward thicker and thicker manuals.

Before you despair when faced with an overwhelming manual, note that manuals are also becoming easier to understand and companies are paying more attention to first time users. They are providing more examples, especially of what you actually see on the screen. However, quality varies greatly, and some manuals seem to be written by programmers for programmers. If you are not a programmer, you might have difficulty making full use of such a program.

Leaf Through the Manual

We favor a quick tutorial in the beginning of the manual as opposed to launching into chapter after chapter of commands. You can often sit down in a computer store, peck out the tutorial, and get a feel for the program immediately. Also, once you have the basics down, you can learn the more complex functions as you need them.

For those who find the manual overwhelming, many companies offer a hotline to answer questions. Also, if the manual doesn't suit you, you can choose from the myriad of books and reference guides available to teach you how to use some of the more popular word processors.

Add-On Packages

No discussion on the ins and outs of word processing would be complete without mentioning several options to add to your word processing program. These include spelling checkers, grammar checkers, thesauruses, and style checkers.

A spelling checker checks the spelling of the words in your text against a dictionary stored on disk. It finds words that do not agree with the dictionary and brings them to your attention. Thus, it finds not only spelling errors but typos, too. This is an invaluable aid in presenting perfect papers.

The dictionary is most important in a spelling checker. Most run from 20,000 words to over 100,000 words. The larger the dictionary, the more time the program takes to check your text, but then again, it is also more accurate.

Several spelling checkers solve the time versus accuracy dilemma by loading a subset of the dictionary into RAM. This subset contains the most commonly used words, speeding up the process of checking words considerably.

Another subset is a personal dictionary. The checker gives you the option of placing special words in the dictionary. Company and product names, industry-specific terms, abbreviations, and acronyms can be entered in the dictionary and, thus, accepted as properly spelled words.

Spelling checkers should display the word in question and give you the opportunity to either accept the word as spelled correctly or change the spelling. You should also have the option to enter the word into your personal dictionary.

The better spelling checkers let you see the word in context, which means the program displays the sentence or line in which the offending word appears. The best checkers also provide several alternative spellings, although in many cases, the alternatives are not what you are looking for.

Note that spelling checkers do not flag usage errors. As long as the word is spelled correctly, the spelling checker will accept it. For example, it makes no distinction between too, to, and two.

Grammar checkers do such proofreading tasks as checking commas and making sure sentences end with proper punctuation and begin with capital letters. They also find stylistic errors such as sexist pronouns and wordy sentences. However, grammar checkers are relatively new developments, so their accuracy and flexibility are sometimes wanting. If a grammar checker appeals to you, again, try before you buy.

Thesauruses are like their printed counterparts, usually listing synonyms according to parts of speech. Unlike spelling and grammar checkers, which work best after you have finished writing, thesauruses should be integrated into the word processing program and be instantly available while you are using it. After all, you need the words while you are writing, not after. If you stop, exit the word processor, load in the thesaurus, grab a word, exit the thesaurus, load the word processor back in, and get back to your place . . . well, you can see how your train of thought can be derailed.

Like grammar checkers, thesauruses are relatively new developments. Again, we urge you to try before you buy. Most writers of our acquaintance find the printed original faster and easier to use than the electronic version.

Style checkers look for stylistic errors, like passive verbs, awkward phrases, cliches, and wordy phrases. The better ones suggest alternatives, allow you to add your own phrases, and let you make corrections.

Integrated Packages

Within the last year, several integrated packages have entered the marketplace, combining word processing with several other packages—usually spreadsheet and database management programs. We published a special section on integrated packages in our October 1984 issue, so our discussion here will be brief.

Often moving information from a spreadsheet or database to a word processor can be difficult. Integrated packages try solving this dilemma by combining several programs into one, making the exchange of data quick and easy. However, the price you pay is in power.

The word processors in many integrated packages are not as powerful as stand-alone programs and may not offer all the features you want. For the average

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WORD PROCESSOR COMPARISON CHART

Word Processors under $100

Product	Manufacturer	Computer	Price	Memory Requirement	Cursor Control	Standard Editing Functions	Standard Formatting Functions	File Merge Capability
AtariWriter	Atari	Atari	$79.95	16K	Yes	Yes	Yes	Yes
AutoPen	Chattanooga Systems Assn.	Radio Shack Model 100 NEC PC-8201, Olivetti M10	$31.50	8K	Not by word	No replace	No footers	Yes
Bank Street Writer	Broderbund Software	C-64, Apple II, Atari, IBM PC and PCjr	$69.95, PC and PCjr $79.95	64K-128K	Not by word	Yes	No boldface, No underline, No super- or subscripts	Yes
Bonnie Blue Word Processor	Bonnie Blue Software	IBM PC	$50	192K	Yes	Yes	Yes	Yes
Cheapware Letter Manuscript Writer	Robert L. Nicolai	IBM PC and PCjr	Basic version $30, Compiled version $45	128K	Yes	No block operations, No replace	No headers or footers, No triple space	Yes
Circuscript	Circadian Software	Apple II	$39.95	48K	Not by word	Yes	No boldface, No super- or subscripts; No footers	Yes
Color Scripsit	Radio Shack	TRS-80 Color Computer	$49.95	16K	Yes	Yes	No boldface, No underlining, No super- or subscripts	No
CopyArt II	Simutek Computer Products	TRS-80 Model I, III, 4, and 4P	$99	48K	Yes	Yes	Yes	Yes
Creative Writer	Creative Software	Apple II, C-64, IBM PC and PCjr	$49.95	64K	Not by word, Not by page	Yes	No boldface, No underline, No super- or subscripts	No
Cut & Paste	Electronic Arts	Apple IIe, C-64, Atari, IBM PC and PCjr	$49.95	64K	Yes	No search and replace, Delete by character only	No boldface, No underline; No super- or subscripts; Fixed tabs	Yes
Docuwriter jr	CMA Micro Computer	IBM PCjr	$69.95	128K	Yes	Yes	Yes	Yes
Easy Script	Commodore Business Machines	C-64	$99.95	64K	Yes	Yes	Yes	No
FriendlyWriter	Friendlysoft	IBM PC	$89.95	64K	Yes	Yes	No super- or subscripts	No
Good Words	Oak Tree Computing	IBM PC	$99.95	128K	Yes	Yes	Yes	No
HES Writer	Human Engineered Software	C-64	$39.95	64K	Yes	No search and replace	No Boldface, No underline; No super- or subscr	No
HomeWord	Sierra On-Line	Apple II, C-64, Atari	$69.95	64K	Yes	Yes	No Super-or Sub script	Yes
Leading Edge Word Processor	Leading Edge Products	IBM PC	$100	256K	Yes	Yes	Yes	Yes
MacWrite	Apple Computer	Apple Macintosh	$99	128K	Yes	Yes	Yes	No
MegaWriter	Megahouse	Apple II IBM PC	$99.95	64K	Yes	Yes	Yes	Yes
Mscript	Micro-Systems Software	TRS-80 Model I, II, III, 4, 12, 16 IBM PC and PCjr Epson QX-10	$79.95	Model I, III 48K Others 64K	Not by word	Yes	Yes	Yes
My Word	TNT Software	IBM PC	$35	64K	Yes	Yes	Yes	Yes
OmniWriter	Human Engineered Software	C-64	$59.95	64K	Yes	Yes	Yes	Yes
Paperclip	Batteries Included	C-64	$90	64K	Not by screen	Yes	Yes	Yes
PC-Write	Quicksoft	IBM PC and PCjr	Disk, $10 Disk and Manual $75	64K	Yes	Yes	Yes	Yes

On-Screen Help	Split Screen	File Size	Automatic Back-up	SWIG	Mail Merge Capability	Embedded Printer Commands	Printer Support	Copy Protected	Other
No	No	Memory dependent 6 pages for 16K	No	Preview	No	No	Drivers and installation	Yes	–
No	No	12 pages	No	No	With Autopoo M&A	Yes	Installation	No	2.5K program length
Yes	No	10 pages	No	Preview	No	No	No	Includes on-line tutorial	Yes
Yes	No	Memory dependent 16 pages with 128K	No	Yes	Yes	Yes	Drivers	No	–
Yes	No	Disk capacity	No	Yes	Yes	No	No	No	Includes alternate screen text editor
No	15 pages	No	No	No	Yes	No	No	–	–
No	No	9 pages	No	No	Yes	No	No	No	–
Yes	No	6 pages	No	No	Yes	Yes	Drivers	No	Includes vector graphics and math functions
Yes	No	23 pages	No	Yes	With Creative Filer and Creative Calc	No	No	No	–
Yes	No	6 pages	No	No	No	No	Installation	Yes	–
Yes	No	Disk capacity	Yes	Yes	No	Yes	Drivers	No	–
Yes	No	20 pages	No	Yes	No	Yes	Installation	Yes	–
Yes	No	Memory dependent 6 pages for 64K	Yes	Yes	No	No	Drivers and installation	Includes spelling checker	–
Yes	No	Disk capacity	No	Yes	No	Yes	Drivers and installation	Yes	–
No	No	19 pages	No	Preview	No	No	No	Yes	–
Yes	No	4 pages	No	Yes	No	No	Driver	No	Icon driven
Yes	Yes	Disk capacity	Yes	Yes	With optional Merge Print	Yes	Installation	No	–
No	No	20 pages, No chain printing	No	Yes	No	No	Imagewriter only	No	Mouse driven Graphics oriented
No	No	Apple 6 pages IBM 12 pages	No	Yes	Yes	Yes	Installation	Yes	–
No	No	No	Memory dependent	No	No	No	Yes	Drivers and installation	No
Yes	No	Disk capacity	Yes	Yes	Yes	Yes	No	No	Includes calculator and sort function
Yes	No	Disk capacity	No	Preview	Yes	Yes	Installation	Yes	Includes spelling checker
Yes	No	16 pages	No	Preview	Yes	Yes	Drivers and installation	No, but need security key	Performs simple addition and subtraction
Yes	Yes	30 pages	No	Yes	Yes	Yes	No	No	Shareware concept

Word Processors under $100

Product	Manufacturer	Computer	Price	Memory Requirement	Cursor Control	Standard Editing Functions	Standard Formatting Functions	File Merge Capability
Pen Pal	Howard W. Sams	Apple II	$29.95	48K	Not by page	Yes	No footers	Yes
Qwerty Personal Word Processor Qwertyjr	HFK Software	IBM PC IBM PCjr	$99	128K	Yes	Yes	Yes	Yes
Quick-Text II	Distributed Software Systems	IBM PC	$70	128K	Yes	Yes	No super and sub scripts	Yes
Quik-Write	Datamost	C-64	$19.95	64K	Yes	Yes	No super or sub scripts	Yes
Select Write	Select Information Sys	IBM PC and PCjr	$99	128K	Yes	Yes	Yes	Yes
SkiWriter II	Prentice-Hall	C-64, IBM PC and PCjr	$69.95	64K	Not by word	Yes	No footers	Yes
TeleWriter-64	Cognitec	TRS-80 Color Computer	$49.95 Cassette $59.95 Disk	16K	Not by word Continuous scroll	Yes	Yes	Yes
Textra	Ann Arbor Software	IBM PC and PCjr	$95	128K	Yes	Yes	No super- or subscripts	Yes
WordPro 3 Plus/64	Professional Software	C-64	$80	64K	Yes	Yes	Yes	Yes
Wordvision	Bruce & James Software	IBM PC	$80	96K	Yes	Yes	Yes	Yes
WordWriter	Timeworks	C-64	$49.95	64K	Yes	Yes	No headers or footers	Yes
Word-X	Micro Architect	IBM PC	$49	128K	Yes	Block move by line only	Yes	No
The Write Choice	Roger Wagner Publishing	Apple II	$44.95	48K	Yes	Yes	No boldface; No super- or subscripts	Yes
Write, Edit, & Print	Design Enterprises of San Francisco	IBM PC and PCjr Apple II C-64 TRS-80 Model I and III	$49.95	64K IBM and C-64 48K Apple and TRS-80	Yes	Yes, editing by line	Yes	Yes
Write Now!	Cardco	C-64	$49.95	64K	Not by word	Yes	Yes	No
The Write Stuff	Harper & Row	Apple II IBM PC	$59.95	64K	Yes	Yes	Yes	No
Zip Word I	Automation Systems	IBM PC	$45	128K	Not by word	Line editor only No search and replace	No header or footer	No

Word Processors over $100

Apple Writer II Apple Writer III	Apple Computer	Apple II Apple III	II $195 III $275	II 64K III 128K	Yes	Yes	Yes	Yes
Benchmark Word Processor	Metasoft	IBM PC CP/M systems	$395	128K	Yes	Yes	Yes	Yes
Business Word Processor	Prentice-Hall	IBM PC	$250	128K	Not by word	Yes	Yes	Yes
Easywriter II System	Sorcim/IUS	IBM PC	$395	128K	Yes	Yes	Yes	Yes
Edix+Wordix	Emerging Technology	IBM PC, DEC Rainbow	$390	128K	Yes	Yes	Yes	Yes
The ElectroWriter	Alison Software	IBM PC	$249.95	128K	Yes	Yes	Yes	Yes
Executive Secretary	SOF/SYS	IBM PC Apple II	IBM $295, Apple $250	IBM 128K, Apple 48K	Yes	Yes	Yes	Yes

On-Screen Help	Split Screen	File Size	Automatic Back-up	SWIG	Mail Merge Capability	Embedded Printer Commands	Printer Support	Copy Protected	Other
Yes	No	Memory dependent 11 pages with 48K	No	Yes, with scrolling	No	Yes	No	No	–
Yes	No	24 pages	No	Yes	Yes	Yes	No	Yes	–
Yes	No	Disk capacity	No	Yes	Yes	Yes	No	No	Includes spelling checker
Yes	No	13 pages; Chain printing	No	Preview	Yes	Yes	Installation and Drivers	Yes	–
Yes	View two files, but edit only one	Disk capacity	Yes	Yes	No	Yes	Installation	No	–
No	No	C-64 20 pages IBM 40 pages	No	Preview	No	Yes	Installation	No	Includes communications capability
No	No	Memory dependent 2 pages for 16K	No	Preview	No	Yes	Installation	No	–
No	No	40 pages	No	Preview	No	Yes	No	No	–
Yes	No	9 pages	No	Yes	Yes	Yes	No	No	–
Yes	No	Disk capacity	Yes	Yes	No	No	Drivers and installation	No	Includes on-line tutorial
No	No	20 pages	No	Yes	Yes	No	No	Yes	–
Yes	No	15 pages	No	No	Yes	Yes	Installation	No	–
Yes	No	14 pages	No	Yes	Yes	Yes	Installation	Yes	Includes typing tutorial/ game and book The Elements of Style
Yes	No	400 lines	No	Yes	In development	Yes	Installation	No	Extensive menus includes book Write, Edit, & Print
Yes	No	15 pages	No	Yes	Yes	Yes	Installation	Yes	–
Yes	No	Disk capacity	Yes	Yes	No	Yes	Installation	Yes	–
Yes	No	Disk capacity	Yes	Yes	No	No	No	No	No

Yes	Yes	Disk capacity	No	Preview	Yes	Yes	Installation	Yes	–
Yes	No	Disk capacity	No	Yes	Yes	Yes	Drivers and installation	No	–
Yes	Yes	Disk capacity	Yes	Yes	Yes	No	Installation	No	Includes spelling checker
Yes	No	Disk capacity	No	Yes	With EasyPlanner and EasyFiler	No	Installation	No	Includes spelling checker
Yes	Yes	Memory dependent 20 pages with 128K	Yes	No	Yes	Yes	Drivers and installation	No	–
Yes	Yes	Disk capacity	No	Yes	No	Yes	Installation	No	Includes emotional thesaurus
Yes	No	IBM disk capacity Apple 12 pages	No	Yes	Yes	Yes	Yes	No	Includes spelling checker

Word Processors over $100

Product	Manufacturer	Computer	Price	Memory Requirement	Cursor Control	Standard Editing Functions	Standard Formatting Functions	File Merge Capability
The FinalWord	Mark of the Unicorn	IBM PC	$300	IBM 128K	Yes	Yes	Yes	Yes
Format II	Kensington Microware	Apple II	$150	48K	Yes	Yes	Yes	Yes
Freestyle	Select Information Systems	IBM PC	$295	128K	Yes	Yes	Yes	Yes
Horizon Wordprocessing	Horizon Software System	Apple Lisa, IBM PC IX AT&T	$595	500K and Unix operating system	Yes	Yes	Yes	Yes
InteWord	Schuchardt Software Systems	IBM PC	$249	128K	Yes	Yes	Yes	Yes
Ktext	MDBS	IBM PC	$175	192K	Yes	Yes	Yes	Yes
LaScript	Anirek Software Products	TRS-80 Model I, II, III and 4	II $199.95 Others $129.95	48K	Yes	Yes	Yes	Yes
MemoPlan DocuPlan	Chang Laboratories	MemoPlan, IBM PC, DocuPlan CP/M machines	MemoPlan $195 DocuPlan $295	64K	Yes	Yes	Yes	Yes
MP Word	MP Software	IBM PC with SMC operating system	$695	128K	Yes	Yes	Centering by line No boldface, underline, footer, super- or subscripts No	Yes
Multimate	MultiMate International	IBM PC	$495	256K	Yes	Yes	Yes	Yes
Newword	Newstar Software	IBM PC	$249	96K	Yes	Yes	Yes	Yes
Office Writer	Office Solutions	IBM PC, DEC Rainbow, Wang PC	$325	192K	Yes	Yes	Yes	Yes
Palantir Word Processor	Palantir Software	IBM PC	$395	128K	Yes	Yes	Yes	Yes
Peachtext	Peachtree Software	IBM PC, DEC Rainbow	$250	128K	Yes	Yes	Yes	Yes
Peachtext 5000	Peachtree Software,	IBM PC	$425	128K	Yes	Yes	Yes	Yes
Perfect Writer	Thorn EMI Computer Software	IBM PC	$199	128K	Yes	Yes	Yes	Yes
Personal WordPerfect	Satellite Software International	IBM PC	$195	128K	Yes	Yes	Yes	Yes
pfs:Write	Software Publishing	IBM PC Apple II	$140	IBM 128K, Apple 64K	Yes	Yes	No super- or subscripts No right justification	No
Pie Writer	Haydon Software	IBM PC Apple II	IBM $199.95, Apple, TRS-80 Model III and 4, Atari $149.95	IBM 128K Apple, TRS-80, Atari 48K	Yes	Yes	Yes	Yes
Power Text	Beaman Porter	IBM PC, Apple II and III	IBM $399, Apple II $299, Apple III $199	IBM 128K, Apple 64K	Yes	Yes	Yes	Yes
ProofWriter	Image Processing Systems	IBM PC	$250	192K	Yes	Yes	Yes	Yes
Q-One	Quadratron Systems	IBM PC	$595	256K	Yes	Yes	Yes	Yes
Qwerty Professional Word Processor	NFK Software	IBM PC	$325	128K	Yes	Yes	Yes	Yes
Q/Word	TCS Software	IBM PC	$395	128K	Yes	Yes	No super- or subscripts	Yes
ReadiWriter	ReadiWare Systems	IBM PC	$125	128K	Yes	No	Yes	Yes

On-Screen Help	Split Screen	File Size	Automatic Back-up	SWIG	Mail Merge Capability	Embedded Printer Commands	Printer Support	Copy Protected	Other
Yes	Yes	Disk capacity	Yes	Yes	Yes	No	Drivers and installation	No	–
No	No	1 page	No	Yes	Yes	Yes	Installation	No	–
Yes	View two, but edit only one	Disk capacity	Yes	Yes	Yes	Yes	Installation	No	Includes spelling checker and graphics capability
Yes	Yes	Disk capacity	No	Yes	Yes	Yes	Drivers and installation	No	French, German, and Italian versions available
Yes	View two files, but edit only one	Disk capacity	Yes	Yes	Yes	Yes	Drivers and installation	No	–
Yes	No	Memory dependent	Yes	Yes	Yes	Yes	No	No	–
No	No	8 pages	No	Yes	Yes	Yes	Driver	No	–
Yes	Yes	Disk capacity	Yes	Yes	Yes	Yes	Drivers and installation	No	–
Yes	No	Disk capacity	No	Yes	Yes	No	Installation	No	–
Yes	No	Disk capacity	No	Yes	Yes	Yes	Driver	No	Includes spelling checker
Yes	No	Disk capacity	Yes	Yes	Yes	Yes	Drivers and installation	No	–
Yes	No	Memory dependent 64 pages 192K	No	No	Yes	Yes	Drivers	Yes	–
Yes	No	Disk capacity	No	Yes	With Palantir Filer	No	Drivers	No	–
Yes	No	Disk capacity	Yes	Yes	Yes	Yes	Drivers and installation	No	Includes spelling checker and thesaurus
Yes	No	Disk capacity	Yes	Yes	Yes	Yes	Drivers and installation	No	Includes spelling checker, thesaurus, PeachCalc, and List Manager
Yes	Yes	Disk capacity	Yes	Yes	Yes	Yes	Installation	No	Includes spelling checker and thesaurus
Yes	Yes	Disk capacity	No	Yes	Yes	Yes	Installation	No	–
Yes	No	Disk capacity	No	Yes	With pfs:File	Yes	Drivers and installation	Yes	–
Yes	Yes	Disk capacity	Yes	Yes	Yes	Yes	Installation and Driver	No	–
Yes	Yes	Disk capacity	Yes	Yes	Yes	Yes	Drivers and installation	No	–
Yes	No	Disk capacity	Yes	Yes	Yes	Yes	Drivers and installation	Yes	Includes dot-addressable graphics and spelling checker
Yes	Yes	Disk capacity	No	Yes	Yes	Yes	Drivers and installation	Yes	Includes spelling checker
Yes	No	24 pages	No	Yes	Yes	Yes	Drivers	Yes	–
Yes	No	Disk capacity	Yes	Yes	Yes	Yes	Drivers and installation	No	Includes math functions
No	No	Disk capacity	No	Preview	Yes	Yes	Drivers and installation	No	Text formatter

WORD PROCESSOR COMPARISON CHART

Word Processors over $100

Product	Manufacturer	Computer	Price	Memory Requirement	Cursor Control	Standard Editing Functions	Standard Formatting Functions	File Merge Capability
Samna Word III	Samna	IBM PC	$550	256K	Yes	Yes	Yes	Yes
Select: The Word Processor	Select Information Systems	IBM PC	$295	128K	Yes	Yes	Yes	Yes
Spellbinder	Lexisoft	IBM PC	$495	128K	Yes	Yes	Yes	Yes
Superscripsit	Radio Shack	TRS-80 Model III and 4	$199	48K	Yes	Yes	Yes	Yes
Super-Text Professional	Muse Software	Apple II IBM PC	$175	Apple 48K, IBM 128K	Yes	Yes	Yes	Yes
Super-Text Professional Home/Office	Muse Software	Apple II	$125	Apple 48K	Yes	Yes	Yes	Yes
SuperWriter	Sorcim/IUS	IBM PC	$295	96K	Yes	Yes	Yes	Yes
Tock Writer	CMI Software	IBM PC, DEC Rainbow, Apple II	$595	IBM 64K, DEC 128K, Apple 48K	Yes	Yes	Yes	Yes
Vedit	Compuview	IBM PC CP/M machines	$150	64K	Yes	Yes	Limited	Yes
VisiWord Plus	VisiCorp	IBM PC	$195	192K	Not by word	Yes	Yes	Yes
Volkswriter Deluxe	Lifetree Software	IBM PC	$295	128K	Yes	Yes	Yes	No
WES	WB Systems	IBM PC	$495	64K	Yes	Yes	Yes	Yes
Word	Microsoft	IBM PC	$375, $475 with mouse	128K	Yes	Yes	Yes	Yes
Wordcraft	Software Solutions	IBM PC	$400	192K	Yes	Yes	Yes	Yes
WordExec	Signature Software	IBM PC	$395	128K	Yes	Yes	No subscripts	Yes
Word Juggler	Quark	Apple IIe, IIc, and III	II $189 III $239	64K	Yes	Yes	Yes	Yes
WordMARC	MARC Software International	IBM PC	$495	128K	Yes	Yes	Yes	Yes
WordPerfect	Satellite Software International	IBM PC	$495	128K	Yes	Yes	Yes	Yes
Wordplus-PC	Professional Software	IBM PC	$495	192K	Yes	Yes	Yes	Yes
Wordpro 4+	Inlodesigns	Commodore 8064	$450	64K	Not by word or page	Yes	Yes	Yes
Word Right	Structured Systems Group	IBM PC	$495	128K	Yes	No search and replace	Yes	Yes
WordStar	MicroPro International	IBM PC and PCjr, Apple II	$495	64K	Yes	Yes	Yes	Yes
Word Wand	Tanda Software	IBM PC	$395	256K	Yes	Yes	Yes	Yes
WordWriter	Timeworks	IBM PC and PCjr	$130	128K	Yes	Yes	No headers or footers	Yes
Write	Workman & Asso.	CP/M-80 machines	$239	48K	Yes	Yes	Yes	Yes
WriteAway	Midwest Software Asso.	Apple II	$175	64K	Yes	Yes	Yes	Yes
XyWrite II Plus	XyQuest	IBM PC	$300	128K	Yes	Yes	Yes	Yes

On-Screen Help	Split Screen	File Size	Automatic Backup	SWIG	Mail Merge Capability	Embedded Printer Commands	Printer Support	Copy Protected	Other
Yes	Yes	Disk capacity	Yes	Yes	Yes	Yes	Drivers and installation	No	–
Yes	View two files, but edit only one	Disk capacity	Yes	Yes	Yes	Yes	Installation	No	Includes spelling checker
Yes	No	Disk capacity	Yes	Yes	Yes	Yes	No	No	Includes spelling checker Arabic and French versions available
No	Yes	Disk capacity	No	Yes	Yes	Yes	Drivers	No	–
Yes	No	Apple 7 pages, IBM 33 pages	No	Preview	Apple Yes, IBM No	Yes	Installation	Apple Yes, IBM No	–
No	No	Apple 7 pages	No	Preview	Apple	Yes	Installation	Apple	–
Yes	No	17 pages	Yes	Yes	Yes	Yes	Installation	No	Includes spelling checker
Yes	No	256 pages	Yes	Yes	Yes	Yes	Drivers	No	Mainly for scientific applications
Yes	No	Disk capacity	Yes	Yes	With Vmail	No	Installation	Yes	–
Yes	Yes	Disk capacity	No	Yes	With VistFile	Yes	Drivers and installation	Yes	Includes spelling checker
Yes	No	Disk capacity	Yes	Yes	Yes	Yes	Drivers and installation	No	–
Yes	No	Disk capacity	Yes	Yes	Yes	Yes	Drivers	No	Includes math functions
Yes	Yes	Disk capacity	Yes	Yes	Yes	No	Drivers and installation	Yes	Use of mouse optional
Yes	No	Disk capacity	No	Yes	Yes	Yes	Drivers and installation	No	–
No	No	Disk capacity	No	Yes	Yes	Yes	Yes	No	–
Yes	No	Memory dependent 6 pages with 64K	No	Preview	Yes	Yes	Drivers and installation	Yes	Includes spelling checker and replacement key caps
No	No	Disk capacity	Yes	Yes	Yes	No	Drivers and installation	No	Includes spelling checker Hotline support $50 per year
Yes	Yes	Disk capacity	Yes	Yes	Yes	Yes	Drivers and installation	No	Includes spelling checker
Yes	No	19 pages	Yes	Yes	Yes	Yes	Installation	No	Includes spelling checker
No	No	6 pages	No	Preview	Yes	Yes	Drivers and installation	Yes	–
Yes	No	Disk capacity	Yes	Yes	Yes	Yes	Installation	Yes	Includes spelling checker
Yes	No	Disk capacity	Yes	Yes	With MailMerge	Yes	Installation	No	–
Yes	Yes	26 pages	No	Yes	Yes	Yes	Drivers and installation	No	–
Yes	No	20 pages	No	Yes	Yes	Yes	Drivers and installation	Yes	Includes spelling checker, calculator, and pull down menus
Yes	No	16 pages	Yes	Preview	No	Yes	Drivers and installation	No	–
Yes	Yes	16 pages	No	Yes	Yes	Yes	Drivers and installation	No	Includes communication program
Yes	No	Disk capacity	Yes	Yes	Yes	Yes	Drivers and installation	No	–

Choosing And Using A Word Processor

(continued from page 133)

user, this may not present a problem, but for those who need a full-featured program and only occasionally import data, a stand-alone word processor connected to an umbrella program that communicates with the various applications programs may be your best bet.

While we are enthusiastic about integrated packages, we also think they can be improved. Just as word processors have evolved, so will the word processing components of integrated packages as more features are added and they become easier to use.

Choosing a word processing package is an art and a science. Charts, while helpful, cannot take into account the most important variable—you. As we said earlier, word processors are very personal. What is right for one person is not right for another. The most expensive word processor may not be the best. The best selling programs may not be right for you.

So, what final words of wisdom do we have for readers who want to make the best choice and then make the best use of a word processing package? Define your word processing needs; find a program that offers the features you want; and if at all possible, try the program before you buy it.

The more you know about your own needs and the specific way in which a given program will satisfy them, the better will be your chances of chopsing the package that is right for you. And once you start using a word processor that is right for you, you will never want to touch a typewriter again. ■

Word Processors under $100

AtariWriter
Atari
1265 Borregas Ave.
Sunnyvale, CA 94086
(408) 745-2000

AutoPen
Chattanooga Systems Asso.
P.O. Box 22261
Chattanooga, TN 37422
(615) 892-2339

Bank Street Writer
Broderbund Software
17 Paul Dr.
San Rafael, CA 94903
(415) 479-1170

Bonnie Blue Word Processor
Bonnie Blue Software
4395 Princess Path
Liverpool, NY 13088
(315) 652-1304

Chaupware Letter Manuscript Writer
Robert L. Nicolai
4038 N. 9th St.
St. Louis, MO 63147
(314) 621-7618

Circuscript
Circadian Software
P.O. Box 1208
Melbourne, FL 32901
(305) 723-5717

Color Scripsit
Radio Shack
1700 One Tandy Center
Fort Worth, TX 76102
(817) 390-3011

CopyArt II
Nimutek Computer Products
4897 East Speedway Blvd.
Tucson, AZ 85712
(602) 323-9391

Creative Writer
Creative Software
230 East Caribbean Dr.
Sunnyvale, CA 94089
(408) 745-1655

Cut & Paste
Electronic Arts
2755 Campus Dr.
San Mateo, CA 94403
(415) 571-7171

Docuwriter jr
CMA Micro Computer
5172 Santa Fe Trail
Yucca Valley, CA 92284
(619) 365-9718

Easy Script
Commodore Business Machines
1200 Wilson Dr.
West Chester, PA 19380
(215) 431-9100

FriendlyWriter
Friendlysoft
3638 West Pioneer Pkwy.
Arlington, TX 76013
(817) 277-9378

Good Words
Oak Tree Computing
10031 Monte Verde Dr.
Arcadia, CA 91006
(213) 301-7777

HES Writer
Human Engineered Software
150 North Hill Dr.
Brisbane, CA 94005
(415) 468-4711

HomeWord
Sierra On-Line
Sierra On-Line Bldg.
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KERRY LOURASH

Lister: Improving the Apple LIST Command

Lister is a major rework of the Apple LIST command. It is a two-page machine language program that can be loaded and run, without modification, in any part of RAM.

The primary function of Lister is to pack as much information onto the screen as possible without compromising the legibility of the listing. This goal is accomplished in three ways. First, the cramped format of the stock listing is replaced by a full 40-column display.

The second method by which normal Apple listings are compressed requires a bit of explanation. All unnecessary spaces are eliminated when a Basic line is stored in memory. These spaces are "reconstituted" when the line is listed by printing a space before and after each keyword. This strategy saves RAM space and improves the readability of the listing, but it wastes screen space. For example, the stock LIST routine puts two spaces between adjacent keywords and between the number of a line and a keyword that follows it. Lister inserts spaces only where necessary.

Finally, Lister allows multiple ranges separated by commas, so that one Lister command does the work of many LIST commands. For example, the command -50, 140, 200 lists lines 0-50, line 140, and line 200. Syntax checking of the command string is done *before* the command is executed, so you do not have to deduce your mistake after the command string scrolls off the screen.

The lines listed by the last Lister command can be relisted by typing an R. Since the previous command string is stored in the stack area, it may be overwritten. In this case, the Apple will beep, and the prompt will be redisplayed.

Lister has a forward and reverse single-step option. To enter the single-step mode, hit any key while a list is in progress. Should you wish to enter this mode immediately, a short delay is provided between the time you hit the RETURN key and the start of the listing. The single-step mode options are shown in Figure 1.

Lister displays control characters as inverse characters. If a line containing an inverse character is edited with the cursor movement keys, the control character will be retained in the line.

Take a Test Drive

Lister can be BLOADed into any two pages of free RAM. It might be called by inserting this line: 0 CALL (address of Lister) or by making the ampersand vector point to Lister. There is no need to include an END command in line 0, since Lister exits to Basic immediate mode.

Figure 1. Single-Step Mode Options.

ESC	Exit single-step mode.
CTRL-C	Go to Basic.
Space bar	Forward single-step.
Retype key	Set end of current range to end of program.
Comma	List next range.
Any other key	Backward single-step.

When Lister is called, an inverse S or D (single- or double-space) prompt appears. If the first character of the command string is a space, the double-space flag will be toggled (from single- to-double-space or vice versa), although the prompt won't change until the next use of Lister. Typing R as a first or second character executes the last command string that was input. If the command string has been overwritten, the Apple will beep and redisplay the input prompt.

Legal command string characters are the digits 0-9, the dash, the comma, the space, and the letter R. A syntax error causes the Apple to beep and redisplay the input prompt.

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Speaker and External Volume Control	✓	✓	✓	✓	
Full Complement of Status Lights	✓	✓	✓		
8 Switch Selectable power-up defaults	✓	✓	✓		
Adaptive Dialing	✓	✓	✓		
Auto Redial on Busy	✓	✓	✓		
Ergonomically designed easy to read front display panel	✓	✓			
Internal Stand-Alone Power Supply	✓	✓			
Built in Real Time Clock/Calendar	✓				
Help Command	✓				
300 baud connect while maintaining 1200 baud RS-232 link	✓				
EXPANDABLE OPTIONS					
Automatic Receiver Buffer	✓				
Automatic Transmit Buffer	✓				
On-board Personal/Business Directory	✓				
Buffer, Expandable to 64K	✓				
Auto Logon Macros	✓				
Auto message transmission to groups of numbers	✓				
Records call duration	✓				
12-character Alphanumeric Display	✓				

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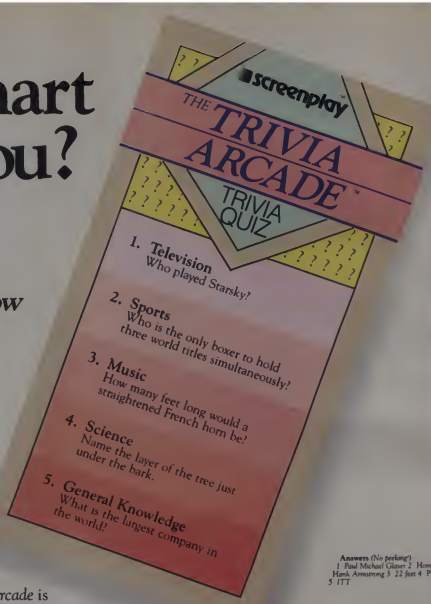
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Suppose a multiple-range command, such as -200, 900-1000 is input. When listing lines 0-200 and single-stepping through the program, you can look at lines greater than 200 by pressing the retype key. It is also possible, when listing lines 900-1000, to see the lines less than 900, even back to the start of the program. If you are listing the range -200 and wish to skip to the range (900-1000), you can type a comma. After the lines have been listed, it is possible to edit them and do a relist to be sure the lines are as expected.

Lister is compatible with the Apple Global Program Line Editor if the GPLE key buffer is turned off. When the key buffer is operational, the Lister single-step commands are stored in the buffer instead of being executed.

To get a hard copy of Lister output, it is best to type in the command string without the printer activated and exit Lister (CTRL-C) when the listing is as desired. *Then* do a PR#1 and use the relist option. This method sidesteps the problem of typing in a complicated command string that isn't echoed to the screen.

The Key to Keywords

Two bits hold the information for the leading and trailing space of each keyword (1=yes, 0=no). The bits for four keywords are stored in one byte. A table near the start of Lister holds these bytes. Leading or trailing spaces can be changed by finding the keyword in the table and changing the corresponding two bits.

Suppose you want the keyword SPEED to have a leading space when listed. Select the byte in the table that contains the bit pair for SPEED. Isolate the bit pair, 01/00/0111, and change the first bit of the bit pair to 1, 01/10/0111. Now, put this change into the source code or calculate the hex equivalent (#$67) and put it into the Lister program in place of the original byte.

How Lister Works

The ENTRY routine prints the input prompt (inverse S or D) and receives the command string. The command string is checked for a leading space (toggles double-space flag) or an R (uses previous command string) before it is stored in the stack. If a syntax error is found, the Apple beeps and Lister goes to the start of ENTRY. If the command string passes inspection, the first range in the command string is parsed. The return flag is set if there are more ranges to list.

The first step in listing a line is to output an inverse space, which facilitates finding the start of a line on the screen. If the output is sent to a printer, this space will probably be printed as a normal space.

If the character is a token, its two space bits are retrieved from the table, and a leading space is output, if indicated. The keyword corresponding to the token is output (? is output for PRINT), and a trailing space is output, if necessary.

If the character is not a token, it is output as a normal character or as an inverse letter if it is a control character. A space is added after a colon, unless it is in a PRINT statement. *Warning:* colons in REMs will have a space inserted after them.

When designing Lister, I was hesitant to include any printer-dependent features which might not be compatible with all printers. Features that you might want to add include:

- Select printer and send a printer setup string.
- Print control characters in lowercase or other distinctive mode.
- Indent line numbers.
- View the command string on the screen as it is typed. ■

Listing 1.

```
                    1  ****************************
                    2  *                          *
                    3  *        LISTER            *
                    4  *   BY JERRY LOURASH       *
                    5  *       1/19/84            *
                    6  *                          *
                    7  *   ASSEMBLED WITH         *
                    8  *   MERLIN BY  SOS         *
                    9  *                          *
                   10  ****************************
                   11  AMPERV     =    $03F5      ;AMPERSAND VECTOR
                   12  BELL      =    $FF3A      ;BELL TONE
                   13  CHRGET    =    $00B1      ;GET NEXT CHARACTER
                   14  CHRGOT    =    $00B7      ;GET CURRENT CHARACTER
                   15  CROO      =    $OAFB      ;DO LF,CR
                   16  CV        =    $25        ;CURSOR'S VERTICAL LOCATION
                   17  DBLSPFLG  =    $9B        ;DOUBLE SPACE FLAG
                   18  DOSRCNCT  =    $03EA      ;DOS RECONNECT ROUTINE
                   19  HOME      =    $FC58      ;HOME CURSOR
                   20  KEYTABL   =    $9D        ;POINTER TO KEYWORD TABLE
                   21  FNDLIN    =    $D61A      ;FIND A BASIC LINE IN MEMORY
                   22  FORPNT    =    $85        ;STORAGE FOR LINE INDEX (Y-REG)
                   23  IN        =    $0200      ;INPUT BUFFER
                   24  INLIN     =    $D52C      ;INPUT A LINE
                   25  KBD       =    $C000      ;KEYBOARD INPUT PORT
                   26  KBDSTRB   =    $C010      ;KEYBOARD STROBE
                   27  LINGET    =    $DA0C      ;CONVERT ASCII LINE NUMBER TO HEX
                   28  LINNUM    =    $50        ;HOLDS END-OF-RANGE LINE NUMBER
                   29  LINPRT    =    $ED24      ;HEX LINE # TO ASCII & PRINT IT
                   30  LOWTR     =    $9B        ;POINTER TO NEXT LINE
                   31  OUTOO     =    $0B5C      ;OUTPUT ONE CHARACTER
                   32  OUTQST    =    $0B5A      ;OUTPUT A "?"
                   33  OUTSP     =    $0B57      ;OUTPUT A SPACE
                   34  QUOFLG    =    $9F        ;QUOTE FLAG
                   35  RESTART   =    $D43C      ;ASOFT IMM MODE ENTRY
                   36  RETURN    =    $FF58      ;LOCATION $FF58 CONTAINS AN RTS
                   37  RTNFLG    =    $1A        ;RETURN-TO-GET-ANOTHER-PARM FLAG
                   38  SETVID    =    $FE93      ;SPECIFY OUTPUT TO CRT
                   39  SPACFLG   =    $A8        ;INDICATES A SPACE WAS OUTPUT
                   40  STORADV   =    $FBF0      ;OUTPUT CHARACTER, ADVANCE CURSOR
                   41  STACK     =    $0100      ;START OF STACK
                   42  STAK      =    $0111      ;START OF PARM BUFFER IN STACK
                   43  TABLOC    =    $3A        ;POINTER TO SPACE TABLE
                   44  TEMP      =    KEYTABL    ;NEXT LINE POINTER FOR BKWD LIST
                   45  TOKSAV    =    $93        ;HOLDS CURRENT TOKEN --#$80
                   46  TOKTABL   =    $D000      ;BASIC KEYWORD TABLE
                   47  TXTPTR    =    $B8        ;PARSER POINTER
                   48  TXTTAB    =    $67        ;START OF PROGRAM TEXT
                   49  UP        =    $FC1A      ;MOVE CURSOR UP 1 LINE
                   50  WAIT      =    $FCAB      ;DELAY ROUTINE
                   51
B000: 20 1A FC     52  PRINTER   JSR  UP         ;CURSOR UP 1 LINE
B003: A5 25        53            LDA  CV         ;CURSOR VERTICAL POSITION
B005: 20 5C FC     54            JSR  HOME+4     ;CLEAR SCREEN LINE
B008: 20 58 FF     55  INITLOC   JSR  RETURN     ;FIND ADDRESS OF INITLOC
B00B: BA           56            TSX
B00C: BC 00 01     57            LDY  STACK,X    ;ADDRESS OF INITLOC FROM STACK
B00F: CA           58            DEX
B010: BD 00 01     59            LDA  STACK,X
```

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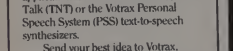

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votrax

CIRCLE 212 ON READER SERVICE CARD

LISTER(CONT'D)

```
                        CLC
                        ADC   #TABL-INITLOC-2 ;ADD OFFSET OF TABL TO IT
                        BNE   SET
                        INY
                  SET   STA   TABLOC          ;AND STORE IT IN TABLOC ($3A,3B)
                        STY   TABLOC+1
                        BNE   ENTRY
                ;
                ;*****************************************************
                ; * TABLE OF TOKEN FORMATS.  EACH BIT PAIR REPRESENTS A
                ; * LEADING AND TRAILING SPACE (1) OR NO SPACE (0)
                ;
                TABL    DFB   %00010101     ;END, FOR, NEXT, DATA
                        DFB   %01010101     ;INPUT, DEL, DIM, READ
                        DFB   %00001010     ;GR, TEXT, PR#, IN#
                        DFB   %01010101     ;CALL, PLOT, HLIN, VLIN
                        DFB   %00000001     ;HGR2, HGR, HCOLOR=, HPLOT
                        DFB   %01010100     ;DRAW, XDRAW, HTAB, HOME
                        DFB   %00000000     ;ROT=, SCALE=, SHLOAD, TRACE
                        DFB   %00000000     ;NOTRACE, NORMAL, INVERSE, FLASH
                        DFB   %00000100     ;COLOR=, POP, VTAB, HIMEM:
                        DFB   %00000001     ;LOMEM:, ONERR, RESUME, RECALL
                        DFB   %01000111     ;STORE, SPEED=, LET, GOTO
                        DFB   %01010001     ;RUN, IF, RESTORE, &
                        DFB   %11000100     ;GOSUB, RETURN, REM, STOP
                        DFB   %01011111     ;ON, WAIT, LOAD, SAVE
                        DFB   %01010100     ;DEF, POKE, PRINT, CONT
                        DFB   %01000100     ;LIST, CLEAR, GET, NEW
                        DFB   %01111110     ;TAB(, TO, FN, SPC(
                        DFB   %11111111     ;THEN, AT, NOT, STEP
                        DFB   %00000000     ;+, -, *, /
                        DFB   %00111100     ;^, AND, OR, >
                        DFB   %00001010     ;=, <, SGN, INT
                        DFB   %10000010     ;ABS, USR, FRE, SCRN(
                        DFB   %10101010     ;PDL, POS, SQR, RND
                        DFB   %10101010     ;LOG, EXP, COS, SIN
                        DFB   %10101010     ;TAN, ATN, PEEK, LEN
                        DFB   %10101010     ;STR$, VAL, ASC, CHR$
                        DFB   %10101000     ;LEFT$, RIGHT$, MID$
                ;
                ;*****************************************************
                ; * INPUT & COMMAND INTERPRETER
                ;
  803A: 20 3A FF  103   ERROR   JSR   BELL
  803D: A2 13     104   ENTRY   LDX   #$13-$40      ;SINGLE SPACE PROMPT
  803F: A5 9B     105           LDA   DBLSPFLG      ;DOUBLE SPACE OPTION ON?
  8041: 10 02     106           BPL   E1            ;NO, BRANCH
  8043: A2 04     107           LDX   #$D-$40       ;DOUBLE SPACE PROMPT
  8045: 20 2E D5  108   E1      JSR   INLIN+2       ;GET LIST PARMS
  8048: 9A        109           TXS                 ;SET STACK POINTER TO $01FF
  8049: 8A        110           TXA                 ;A=#$FF= "WAIT" COUNTER
  804A: 20 A8 FC  111           JSR   WAIT          ;ALLOW TIME TO ENGAGE SSTEP
  804D: 20 A8 FC  112           JSR   WAIT
  8050: 20 A8 FC  113           JSR   WAIT
  8053: E8        114           INX                 ;INCREMENT TXTPTR
  8054: C8        115           INY
  8055: B6 B8     116           LDX   TXTPTR        ;PARSER TO START OF INPUT BUFFER
  8057: 84 B9     117           STY   TXTPTR+1      ;Y=2
  8059: AD 00 02  118           LDA   IN            ;GET 1ST BUFFER CHARACTER
  805C: C9 20     119   DBLSPC? CMP   #$20          ;TOGGLE DOUBLESPACE FLAG?
  805E: D0 09     120           BNE   RELIST?       ;NO, CHECK FOR RELIST
  8060: A5 9B     121           LDA   DBLSPFLG      ;TOGGLE DOUBLE SPACE FLAB
  8062: 49 80     122           EOR   #$80
  8064: 85 9B     123           STA   DBLSPFLG
  8066: 20 B1 00  124           JSR   CHRGET        ;GET CHARACTER
  8069: C9 52     125   RELIST? CMP   #'R'          ;RELIST OPTION ?
  806B: F0 0E     126           BEQ   SETPTR
  806D: A6 B8     127           LDX   TXTPTR        ;MOVE PARMS TO STACK
  806F: A0 FF     128           LDY   #$FF
  8071: E8        129   MOVE    INX
  8072: C8        130           INY
  8073: BD FF 01  131           LDA   IN-1,X        ;GET CHARACTER FROM BUFFER
  8076: 99 11 01  132           STA   STAK,Y        ;STORE CHARACTER IN STACK
  8079: D0 F6     133           BNE   MOVE          ;LOOP IF CHARACTER IS NOT A NULL
  807B: A9 10     134   SETPTR  LDA   #STAK-1       ;POINT PARSER AT STACK BUFFER
  807D: 85 B8     135           STA   TXTPTR
  807F: AA        136           TAX
  8080: C6 B9     137           DEC   TXTPTR+1      ;SAVE LO BYTE OF POINTER
  8082: 20 B1 00  138   CHECK   JSR   CHRGET        ;SET HI BYTE = 1
  8085: 90 FB     139           BCC   CHECK         ;NOW CHECK REST OF LINE
  8087: F0 0A     140           BEQ   CK:DONE       ;NUMBER?
  8089: C9 2D     141           CMP   #'-           ;IF NULL, THEN DONE
  808B: F0 F5     142           BEQ   CHECK         ;DASH?
  808D: C9 2C     143           CMP   #','          ;YES, NEXT CHARACTER
  808F: F0 F1     144           BEQ   CHECK         ;COMMA?
                                                    ;YES, NEXT CHARACTER
```

```
                        BNE   ERROR       ;NONE OF THE ABOVE?
                        
                        STX   TXTPTR      ;REGET PARSER POINTER
                        JSR   CHRGET      ;GET A CHARACTER
                        JSR   LINGET      ;CONVERT 16T NUMBER TO HEX
                        JSR   FNDLIN      ;FIND LINE IN MEMORY
                        JSR   CHRGOT      ;GET CHARACTER AFTER LINE NUMBER
                        BEQ   FLAG        ;FOUND END OF LINE(NULL)?
                        CMP   #','        ;ANOTHER PARM?
                        BEQ   FLAG        ;LI8T THE PARM
                        JSR   CHRGET      ;GET 2ND LINE NUMBER
                        JSR   LINGET
                        JSR   CHRGOT
                        STA   RTNFLG      ;SET RETURN FLAG
                        LDA   LINNUM      ;IF THERE'8 NO 2ND LINE NUMBER
                        ORA   LINNUM+1
                        BNE   NEXLIST
                        DEC   LINNUM      ;THEN SET 2ND LINE NUMBER =65535
                        DEC   LINNUM+1
                        
                        ********************************************************
                        * LIST A BINGLE RANGE
                        
NEXLIST                 LDY   #0          ;CLEAR QUOTE FLAG
                        STY   QUOFLG
                        LDA   (LOWTR),Y   ;GET HI BYTE OF NEXT LINE POINTER
                        BEQ   EXIT        ;NO PROGRAM IN WORKSPACE: EXIT
                        INY               ;LO & HI BYTE OF NEXT LINE NUMBER
                        LDA   (LOWTR),Y
                        TAX
                        INY
                        LDA   (LOWTR),Y
                        CMP   LINNUM+1    ;COMPARE TO END OF RANGE
                        BNE   LSTD"       ;DONE?
                        CPX   LINNUM
                        BEQ   LST1
LSTD"                   BCC   LST1
EXIT                    LDA   RTNFLG      ;IS THERE ANOTHER PARM TO LI8T?
                        BNE   REFEAT      ;YES, GET ANOTHER PARM
DONE                    BIT   KEBSTRB     ;CLEAR KEY PORT
                        JMP   RESTART     ;TO BASIC IMM. MODE
                        
NEX3                    BNE   NEXLIST     ;STEPPINGSTONE
                        
LST1                    STY   FORPNT      ;SAVE Y-REGISTER
                        PHA               ;SAVE HI BYTE OF LINE NUMBER
                        LDA   #$20        ;OUTPUT 1 INVERSE SPACE
                        JSR   STORADV
                        PLA               ;RESTORE HI BYTE OF LINE NUMBER
                        JSR   LINPRT      ;CONVERT & PRINT LINE NUMBER
                        JSR   OUTSP       ;OUTPUT A SPACE
                        STA   SPACFLG     ;SET SPACE FLAG
NEXCHAR                 INC   FORPNT      ;INCREMENT LINE POINTER
                        LDY   FORPNT
                        LDA   (LOWTR),Y   ;GET NEXT CHARACTER IN LINE
                        BEQ   ENDO        ;BRANCH IF A NULL
TOKEN?                  BPL   SENDCHR     ;BRANCH IF CHARACTER NOT A TOKEN
                        
                        ********************************************************
                        * OUTPUT A TOKEN
                        
                        AND   #$7F        ;CALC OFFSET FOR BPACE TABLE
                        STA   TOKSAV      ;SAVE IT
                        LSR               ;DIVIDE BY 4
                        LSR               ;THROW AWAY REMAINDER
                        TAY               ;OFFSET IN Y-REGISTER
                        LDA   (TABLOC),Y  ;BPACE BYTE IN A-REGISTER
                        PHA               ;BPACE BYTE TO STACK
                        LDA   TOKSAV      ;TOKEN-#$80 IN A-REGISTER
                        AND   #%00000011  ;CALC BIT OFFBET
                        BEQ   NOSHIFT     ;IS BIT OFFSET=0?
                        TAX               ; STORE IT IN X-REGISTER
                        PLA               ;BPACE BYTE
                        ASL               ;ROTATE SPACE BYTE 80
SHIFT                   ASL               ;THAT CORRECT TOKEN BITS ARE
                        DEX               ;IN BIT 7(LEAD) AND BIT 6 (TRAIL)
                        BNE   SHIFT       ;OF SPACE BYTE
                        PHA               ;BPACE BYTE TO STACK
                        LDX   TOKSAV      ;PUT TOKEN-#$80 IN X-REGISTER
NOSHIFT                 INX               ;= TOKEN -#$7F
                        LDY   #TOKTABL    ;PUT LOCATION OF START OF
                        STY   KEYTABL     ;KEYWORD TABLE IN KEYTABL
                        LDY   #/TOKTABL-$100
                        STY   KEYTABL+1
```


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LISTER(CONT'D)

```
01A5: C9 03      315          CMP  #$03        ;CTRL C?
01A7: F0 B7      316          BEQ  DON         ;QUIT LISTER ROUTINE
01A9: C9 9B      317  ESC     CMP  #$9B        ;ESCAPE KEY?
01AB: D0 I3      318          BNE  COMMA
01AD: BD 10 C0   319          STA  KBDSTRB     ;CLEAR KEY STROBE
01B0: A0 00      320  NOBTEF  LDY  #0
01B2: B1 9B      321          LDA  (LOWTR),Y   ;SET LOWTR TO START OF
01B4: AA         322          TAX              ;NEXT BASIC LINE
01B5: C8         323          INY
01B6: B1 9B      324          LDA  (LOWTR),Y
01B8: F0 A9      325  RANGE   BEQ  XIT         ;BRANCH IF END OF PROGRAM
01BA: B6 9B      326  PRE     STX  LOWTR
01BC: B5 9C      327          STA  LOWTR+1
01BE: D0 BA      328          BNE  NEX2        ;GO TO NEXLIBT VIA 2 BRANCHES
                 329
01C0: C9 AC      330  COMMA   CMP  #","        ;GO TO NEXT RANGE?
01C2: F0 F4      331          BEQ  RANGE       ;YES
01C4: C9 95      332  TOEND   CMP  #$95       ;FORWARD ARROW?
01C6: D0 0B      333          BNE  SBTEP
01C8: A9 FF      334          LDA  #$FF        ;YES, SET END OF RANGE TO 65535
01CA: B5 50      335          STA  LINNUM
01CC: B5 51      336          STA  LINNUM+1
01CE: D0 E0      337          BNE  NOBTEP
01D0: C9 A0      338  BSTEP   CMP  #$A0        ;SPACEBAR?
01D2: F0 DC      339          BEQ  NOBTEP
01D4: A5 6B      340          LDA  TXTTAB+1    ;GET BTART OF PROGRAM POINTER
01D6: A6 67      341          LDX  TXTTAB
01D8: E4 9B      342          CPX  LOWTR       ;TRYING TO BACK UP BEYOND THE
01DA: D0 04      343          BNE  SS          ;PGM BTART?
01DC: C5 9C      344          CMP  LOWTR+1
01DE: F0 0D      345          BEQ  CLEAR       ;YES, IDLE FOR A VALID CMD
01E0: 86 9D      346  SS      STX  TEMP        ;PUT PGM START ADDR INTO TEMP
01E2: B5 9E      347          BTA  TEMP+1
01E4: A0 00      348  BAKWARD  LDY  #0
01E6: B1 9D      349          LDA  (TEMP),Y    ;IB NEXT-LINE POINTER
01E8: C8         350          INY
01E9: AA         351          TAX
01EA: E4 9B      352          CPX  LOWTR       ;EQUAL TO CURRENT LINE LOCATION?
01EC: D0 9C      353          BNE  AGAIN       ;NO, TRY NEXT LINE
01EE: B1 9D      354          LDA  (TEMP),Y
01F0: C5 9C      355          CMP  LOWTR+1
01F2: D0 EC      356          BNE  SS          ;FIND NEXT LINE & TRY AGAIN
01F4: A6 9D      357          LDX  TEMP        ;PUT PREVIOUB LINE LOC. IN TEMP
01F6: A5 9E      358          LDA  TEMP+1
01F8: D0 C0      359          BNE  PRE         ;ALWAYS
01FA: B1 9D      360  AGAIN   LDA  (TEMP),Y    ;HI BYTE OF NEXT LINE LOC
01FC: D0 E2      361          BNE  BB          ;ALWAYS
                 362  END
```

```
--End assembly--

510 bytes

Errors: 0
```

Symbol table - alphabetical order:

```
   AGAIN    =$01FA   ?  AMPERV   =$03F5   ?  BAKWARD  =$01E4      BELL     =$FF3A
   CHECK    =$B0B2      CHRGET   =$B1                 CHRGOT   =$B7      CKDONE   =$B093
   CLEAR    =$B19D      COMMA    =$01C0               CRDO     =$DAFB     CV       =$25
   CURSH    =$B19D      DBLSPFLD =$B95C      ?  DD    =$B19B      DON      =$B13E
?  DBLSPCT  =$B05C      DOSRCNCT =$03EA           E1       =$B045   ?  END      =$B1FE
   DONE     =$B0DA   ?  ENDO     =$B161            ENDOLINE =$B18A      ENTRY    =$B83D
?  ENDLIN   =$B0A7      ERROR    =$B05A   ?  ESC   =$B1A9      EXIT     =$B0D6     FLAG     =$B0B0
   FNDLIN   =$D61A      FORPNT   =$B5              GETKEY   =$B1A0      HOME     =$FC5B
   IN       =$0200      INITLOC  =$B00B            INLIN    =$D52C      KBD      =$C000
   KBDSTRB  =$C010   ?  KEYTABL  =$9D              LINDET   =$DAEC      LINNUM   =$50
   LINPRT   =$ED24      LOWTR    =$9B              LST1     =$B0E2      LSTD?    =$B0D4
   MOVE     =$B071      NEX2     =$B14A            NEX3     =$B0E0      NEXCHAR  =$B0F3
   NEXCHR   =$B0F1      NEXLIST  =$B0BC            NEXTOKN  =$B122      NORMAL   =$B16E
   NOBHIFT  =$B115      NOBTEP   =$B1B0            OUTDO    =$DB5C      OUTQST   =$DB5A
   OUTSP    =$DB57      PRE      =$B1BA            PRINT    =$B13F   ?  PRINTER  =$B000
   PRTOK    =$B134      QUOFLG   =$9F              RANGE    =$B1BB      RELIB?   =$B869
   REPEAT   =$B095      RESTART  =$D43C            RETURN   =$FF5B      RTNFLG   =$16
   B2       =$B16C      S3       =$B17B            SENDCHR  =$B165      BET      =$B819
   SETPTR   =$B07B   ?  SETVID   =$FE93            SHIFT    =$B10F      SPACE    =$B0EE
   BPACFLB  =$A0        SB       =$B1E0            SBPACE   =$B191      BSTEP    =$B1D0
   BTACK    =$B180      BTAK     =$0111            BTORADV  =$FBF0   ?  STRTLIN  =$B09B
   TABL     =$B01F      TABLOC   =$3A              TEMP     =$9D        TK1      =$B12A
?  TOEND    =$B1C4      TOK1     =$B151            TOK2     =$B15F      TOKDONE  =$B15A
?  TOKEN?   =$B0FB      TOKLP    =$B125            TOKLUP   =$B14C      TOKSAV   =$93
   TOKTABL  =$D0D0      TXTPTR   =$B8              TXTTAB   =$67        UP       =$FC1A
   WAIT     =$FCA8      XI       =$B132            XIT      =$B163
```

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CIRCLE 102 ON READER SERVICE CARD

STEVEN PEACOCK

Solving the Stagecoach Problem by Computer

Branch And Bound Techniques

Critical path scheduling has been a vital management tool for several decades. As a result, scores of techniques and programs have been developed to solve critical path problems. Hence, we tend to be somewhat wary of articles claiming a new approach to solving such problems.

Well, Steven Peacock didn't claim he had a new approach; however, to our jaded eyes it looked interesting, different, and, well, creative. We hope you agree.—DIA

There is a classic problem that is described in many management science and operations research textbooks called the stagecoach problem. The gist of the problem is that a man has to cross the country on a stagecoach. The insurance rates are different for each leg of the journey depending on the dangers that exist in that particular part of the country. A total of 18 stages connect in a network that can get him across the country (Figure 1). The man wants to take the route that will cost him the least.

The same type problem exists today in the planning of projects in business and industry. With the Critical Path Method (CPM), managers examine projects to determine the maximum time it will take to complete all phases of the project.

The normal method for solving these problems by hand is to work your way through the network that connects the important events in the life of a project calculating the minimum and maximum time it may take to get to each node. The purpose of the following program is to get the computer to find the longest or shortest path through the network.

The Algorithm

It is quite simple to find the shortest path. Let the computer follow the first path that it finds all the way through the network. This then becomes the shortest path. Next backtrack to the node before the end and examine any other paths that may lead from it. If at any time the current time value exceeds that of the shortest path, we know that particular path cannot be the solution, so we back up again and repeat the process. Each time the computer makes it to the last node without exceeding the minimum time, it has found a shorter path. We then save the shortest path and time. then restore the original time values and compute the value of the longest path.

Storage of the Network

The real challenge in programming a solution to this problem is how to represent the network structure in Basic. Initially I had thought of using a three- or four- dimensional array. This was a cumbersome process and was discarded early one morning when I was struck with the idea of using strings.

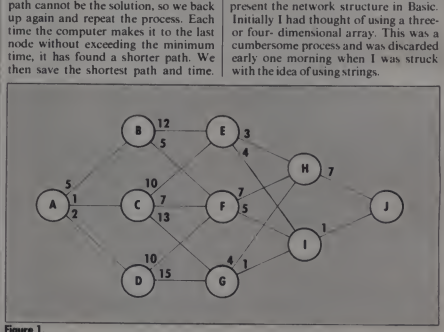

Figure 1.

When we run out of nodes to which we can backtrack, we know we are through.

This is fine for the shortest path, but with the longest path, we can't check to see if an alternative route is longer because any path will always be shorter than the longest path until the end is reached. To handle this, the program adds all the individual times together to get a total. All of the individual times are then subtracted from that total. This makes the longer paths have smaller values and the shorter paths have a larger value. Using these new values the computer can solve for the shortest path and

The network is stored in a string array, each element of which represents one node. The first character of that element is the node represented by that element. To speed up search time, the nodes are arranged in the array according to their ACSII code minus 64. The characters following the first one are the modes that are pointed to by the first character.

The paths that connect the nodes are stored in an array individually for time look up purposes. Each element of this array has a two-character value that corresponds with a path in the network. In a corresponding numerical array, the

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CIRCLE 103 ON READER SERVICE CARD

times between the nodes in the string array are stored.

The Program

The initialization of the following program for the TRS-80 Model III is divided into three routines. The first ascertains the number of paths and nodes in the network and whether you want to minimize or maximize the network. The second initialization routine gets all of the nodes that are pointed to by each individual node. The last of the initialization routines gets the times between the nodes. If the user decides to maximize, a fourth routine is called to reverse the numbers so that minimization will solve the problem.

The program then sets up to begin solution of the network. The current time is set to zero along with the shortest path string (TT and SP$). The node index and the node pointer (N1% and NP%) are set to 1 and 2 respectively. These values are then pushed on to a stack for later recall. Using these values, the computer then enters the routine that looks up the time value for the path that they indicate. The value is added to the current time and then compared with the minimum time.

If the current time is less than the minimum time, the path is added to the shortest path string and the computer advances to the node indicated by the node pointer (NP%). The computer examines the ASCII value of the node to see if it is the last node. If it is, a shorter path than the existing one has been found and must be saved. If it is not the last node, the node index is set to this node and the node pointer is reset to 2. This gives the computer the first path available from the new node. The computer than returns to the Find Time and Get Line Routine from which it came.

If the current time is greater than the minimum time or the end of the path has been reached and saved, the computer goes to the Check Other Branches Routine. It first checks to see if the stack is completely empty. If it is, the computer knows that it has examined all possible paths. If not, the computer pops the stack of the last node pointer and node index used. The time for that path is then looked up and subtracted from the current time and that path is removed from the shortest path. The node pointer is then incremented to provide the next node that the node index can be combined with to produce a path.

When the node pointer value is greater than the length of the string that corresponds with the node index, there are no more paths to be examined from this node and this routine is entered again. If there are more paths from this node, control is returned to the Set Up Next Line routine at the point where the node index and node pointer values are pushed onto the stack.

When the stack is empty, the computer turns control over to the All Through routine. If this was a maximization problem, the computer restores the original times into the time array and looks up the times from the minimum path string (MP$) to calculate the time needed to traverse the network. The result of the program execution is then printed. ■

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BRANCH AND BOUND (CONT'D)

Listing 1.

```
1 CLEAR 5000
10 REM **** BRANCH AND BOUND TECHNIQUES ****
20 ' FEB 4, 1984 ..... STEVEN C. PEACOCK
40 '
50 REM **** MAINLINE ****
60 GOSUB 1000 :' go set initialization information
70 GOSUB 2000 :' set the information from user
80 GOSUB 3000 :' set time information
90 GOSUB 5000 :' start solving problem
100 END
110 REM **** END MAINLINE ****
120 '
130 '
140 '
150 '
1000 REM **** GET INITIALIZATION INFO ****
1020 CLS
1040 PRINT "How many paths are in the network ";
1060 LINE INPUT AA$
1080 NPX=VAL(AA$)
1100 PRINT:PRINT
1120 PRINT "Beginins node name is -----> A"
1140 PRINT:PRINT
1160 PRINT "Enter the endins node name :";
1180 LINE INPUT AA$
1220 NNX=ASC(AA$)-65
1240 CLS
1280 DIM NA$(26),LA$(NPX),TA(NPX),MA(NPX),STX(100)
1300 MT=1E+30:' set min time to max value
1320 SPX=0:' set stack pointer
1330 CLS
1340 PRINT "Do you wish :"
1350 PRINT TAB(10) "(1) MAXIMUM time through network"
1360 PRINT TAB(10) "(2) MINIMUM time through network"
1370 INPUT MVX
1380 IF MVX<1 OR MVX>2 THEN
        GOTO 1330:' if invalid input then try again
1390 RETURN
1400 REM **** END GET INITIALIZATION INFO ****
1410 '
1420 '
1430 '
1440 '
1450 '
2000 REM **** GET THE NODE PATHS ****
2020 CLS
2040 FOR KX=I TO NNX:' loop from besin to end of nodes
2060   WN$=CHR$(KX+64):' set what node to node desired
2080   PRINT "Enter the nodes pointed to by ";WN$
2100   LINE INPUT AA$
2120   NA$(KX)=WN$+AA$
2140 NEXT KX
2160 RETURN
2180 REM **** END GET THE NODE PATHS ****
2520 '
2540 '
2560 '
2580 '
3000 REM **** GET TIMES BETWEEN NODES ****
3010 CLS
3020 AIX=I
3040 FOR KX=I TO NNX:' loop through the node array
3060   FOR JX=2 TO LEN(NA$(KX));' loop through nodes pointed at
3080       LU$=LEFT$(NA$(KX),I)+MID$(NA$(KX),JX,I);' set node path to ask
for
3100       PRINT "Enter value for path ";LU$
3120       LINE INPUT AA$
3140       LA$(AIX)=LU$:TA(AIX)=VAL(AA$);' store lookup in strins and time
in numeric
3160       AIX=AIX+I
3180   NEXT JX
3200 NEXT KX
3210 AIX=AIX-I
3212 GOSUB 15000:' so print title page
3215 IF MVX=I THEN
        GOSUB 3500:' if maximumization then so fix up more
3220 RETURN
3240 REM **** END GET TIME BETWEEN NODES ****
3260 '
3280 '
3300 '
3320 '
3500 REM **** MAXIMIZATION FIX UP ROUTINE ****
```

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BRANCH AND BOUND (CONT'D)

```
3510 MT#=0:' set accumulator to 0
3520 FOR JX=1 TO A1%
3530   MT#=MT#+TA(JX):' accumulate times
3540 NEXT JX
3550 FOR JX=1 TO A1%
3560   MA(JX)=TA(JX):' set maximization array to time
3570   TA(JX)=MT#-TA(JX):' modify time array for minimization
3580 NEXT JX
3590 RETURN
3600 REM **** END MAXIMIZATION FIX UP ROUTINE ****
3610 '
3620 '
3630 '
3640 '
3650 '
3660 '
5000 REM **** SOLUTION START ROUTINE ****
5020 TT=0:' set current time to 0
5040 MP$="":SP$="":'SET MINIMAL PATH & SHORT PATH TO BLANK
5060 NI%=1:' set index to 1
5080 NP%=2:' set strins pointer to 2
5100 SP%=SP%+1:' increment stack pointer
5120 STX(SP%)=NI%:' push ni% on stack
5140 SP%=SP%+1:' increment stack pointer
5160 STX(SP%)=NP%:' push np% onto stack
5180 GOTO 6000:' set the line and find the time
5200 REM **** END SOLUTION START ROUTINE ****
5220 '
5240 '
5260 '
5280 '
6000 REM **** FIND LINE AND GET TIME ****
6020 LU$=LEFT$(NA$(NI%),1)+MID$(NA$(NI%),NP%,1):' set look up strins
6040 GOSUB 9000:' go find the time (returns tm)
6060 TT=TT+TM:' add tm to existing time
6080 IF TT>MT THEN
        SP$=SP$+LU$+" "!
        LPRINT TAB(0) SP$!!
        LPRINT TAB(35) TT!!
        LPRINT TAB(50) MT!
        GOTO 8000:' if time >min then go back on branch
6100 GOTO 7000:' to set up the next line
6120 REM **** END FIND LINE AND GET TIME ****
6140 '
6160 '
6180 '
6200 '
7000 REM **** SET UP THE NEXT LINE ****
7020 SP$=SP$+LU$+" "!' add looked up strins to short path
7030 LPRINT TAB(0) SP$!!
        LPRINT TAB(35) TT!!
        LPRINT TAB(50) MT!
7040 NI%=ASC(RIGHT$(LU$,1))-64!' find index of where to look next
7060 IF NI%>NM% THEN
        GOSUB 10000!
        GOTO 8000:' if at end then save path and check others
7080 NP%=2:' set strins pointer to 2
7100 SP%=SP%+1:' increment stack pointer
7120 STX(SP%)=NI%:' push ni% onto stack
7140 SP%=SP%+1:' increment stack pointer
7160 STX(SP%)=NP%:' push np% onto stack
7180 GOTO 6000:' go find time and line
7200 REM **** END SET UP THE NEXT LINE ****
7220 '
7240 '
7260 '
7280 '
8000 REM **** CHECK OTHER BRACHES ****
8020 IF SP%=0 THEN
        GOTO 11000:' if through then leave
8040 NP%=STX(SP%):' pop np% off stack
8060 SP%=SP%-1:' decrement stack pointer
8080 NI%=STX(SP%):' pop ni% off stack
8090 SP%=SP%-1:' decrement stack pointer
8100 LU$=LEFT$(NA$(NI%),1)+MID$(NA$(NI%),NP%,1):' set look up strins
8120 GOSUB 9000:' go find time for line
8140 TT=TT-TM:' subtract time branching back behind
8145 LPRINT TAB(0) SP$!!
        LPRINT TAB(70) LU$
8160 SP$=LEFT$(SP$,LEN(SP$)-(LEN(LU$)+1)):' take line off short path
8180 NP%=NP%+1:' add one to strins pointer (goto next branch)
8200 IF NP%>LEN(NA$(NI%)) THEN
        GOTO 8000:' if no more from here go back again
8220 GOTO 7100:' set up next to find about it
8240 REM **** END CHECK BRANCH ****
8260 '
8280 '
8300 '
```

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BRANCH AND BOUND (CONT'D)

```
 8320 '
 9000 REM **** FIND TIME ****
 9010 FOR KX=1 TO AIX:' loop through all times
 9020   IF LEFT$(LA$(KX),2)=LU$ THEN
          TM=TA(KX):I
          KX=AIX+5:' if time found store & prepare exit
 9030 NEXT KX
 9040 RETURN
 9050 REM **** END FIND TIME ****
 9060 '
 9070 '
 9080 '
 9090 '
10000 REM **** SAVE PATH ****
10010 MP$=SP$
10020 MT=TT
10030 RETURN
10040 REM **** END SAVE PATH ****
10050 '
10060 '
10070 '
10080 '
11000 REM **** ALL THROUGH ****
11005 CLS
11006 IF MVX=1 THEN
        GOSUB 11500:' if maximization so redo times
11010 LPRINT "The fastest path is "
11020 LPRINT TAB(10) MP$
11030 LPRINT "The time along this path is "
11040 LPRINT TAB(10) MT
11050 RETURN
11060 REM **** END ALL THROUGH ****
11070 '
11080 '
11090 '
11100 '
11500 REM **** REFIGURE TIME FOR MAXIMIZATION ****
11510 FOR JX=1 TO AIX:' loop through
11520   TA(JX)=MA(JX):' reset time array to real time
11530 NEXT JX
11540 MT=0:' reset minimum time to 0
11550 FOR JX=1 TO LEN(MP$) STEP 3:' loop through minimal path
11560   LU$=MID$(MP$,JX,2):' find look up string
11570   GOSUB 9000:' to get time to go with it
11580   MT=MT+TM:' add to max time
11590 NEXT JX
11600 RETURN
11610 REM **** END REFIGURE TIME FOR MAXIMIZATION ****
11620 '
11630 '
11640 '
11650 '
11660 '
11670 '
15000 REM **** PRINT ALL INFORMATION ****
15010 IF MVX=1 THEN
        TP$="MAXIMIZATION"
      ELSE
        TP$="MINIMIZATION"
15020 LPRINT TAB(15) TP$;" OF TIME THROUGH THE NETWORK"
15030 LPRINT
15040 LPRINT TAB(0) "NODE";:LPRINT TAB(15) "POINTS TO NODES"
15050 FOR JX=1 TO NN%
15060   LPRINT TAB(2) LEFT$(NA$(JX),1);
15070   LPRINT TAB(18) MID$(NA$(JX),2)
15080 NEXT JX
15090 '
15100 LPRINT:LPRINT
15110 LPRINT TAB(0) "NODE PATH";
15120 LPRINT TAB(15) "TIME ALONG PATH"
15130 FOR JX=1 TO AIX
15140   LPRINT TAB(3) LA$(JX);
15150   LPRINT TAB(19) USING "###.##";TA(JX)
15160 NEXT JX
15170 LPRINT CHR$(12)
15180 LPRINT TAB(24)"WORK DONE ON SOLUTION "
15190 LPRINT TAB(0) "CURRENT PATH ";
15200 LPRINT TAB(35) "CURRENT TIME ";
15210 LPRINT TAB(50) "MINIMUM TIME ";
15220 LPRINT TAB(65) "REMOVING NODE "
15230 RETURN
15240 REM **** END PRINT JUNK ON PRINTER ****
15250 '
15260 '
15270 '
15280 '
15290 '
```


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Indexing By Microcomputer

Most serious writers have come up against the problem of making an index at some point in their writing careers. Whether you are writing a business report or a research paper, a specialist monograph or a book, the inclusion of an index—to say nothing of the quality and reliability of that index—can contribute significantly to the appeal of that publication to its readers.

There are, of course, indexes and there are indexes. Some are no more than a list of proper names—people and places—in alphabetical order with a page reference next to each. Others can be highly wrought analyses of the contents of the work, with sub- and subdivisions under each heading.

Whatever the level of sophistication desired, however, there is in all cases a great deal of routine clerical work involved in the compilation of an index. And in these days when authors at all levels are gratefully embracing the microcomputer and its word processing potential, it is only natural that they look to this source for help in compiling the index which will complete their work.

Let it be said at once that you cannot simply dump the completed text into the microprocessor and say: "Compile me an index" any more than you can say to your word processor: "Write me an article." A great deal of skilled input is necessary in both cases before anything of value can emerge at the far end. But there is much that the computer can do to eliminate the sheer mental and physical slog which is an inevitable part of the process.

Let us assume a typical contemporary author, one who now uses a computer instead of a typewriter and who has invested in equipment which will do a reasonably serious job. His system might consist of a machine with a substantial amount of dynamic memory, a couple of disk drives, a Basic interpreter and a printer. His word processing package will do the normal tasks of moving the cursor freely about the screen, doing the regular editorial tasks of inserting, block moving, global search and replace, and similar functions; it must also allow embedded commands for turning the printer on and off, for writing to disk, and for cancelling bi-directional printing, and it must also have among its system variables one which keeps track of the page number as it works through a document. If in addition, our hypothetical author has a Basic interpreter and a sorting package, he will find an immediate and welcome use for them.

Although many of the word processing packages available at present have sections in their manuals on "Indexing," it is usually only on a very rudimentary level.

It must be said at the outset that although many of the word processing packages available at present have sections in their manuals on "Indexing," it is usually only on a very rudimentary level. In most cases if you follow their instructions, you get a simple word list with associated page references listed in page rather than alphabetical order. A really good index requires a good deal more input, both intellectual and programmatical, but the results are worth the effort.

In what follows I describe the measures I have taken to create indexes on my own system, but with a little imagination, the method I outline can be adapted to different machines and different word processing packages.

My system consists of a CP/M machine with 64K RAM and two double sided, double density disk drives with 720K capacity. For software I use *Peachtext* (the former *Magic Wand*), which I prefer for the elegance of its structure and the sophistication of its range, plus MBasic. Other extras I find useful for indexing are Micropro's SuperSort and a Basic interpreter.

Let's take a step-by-step look at the procedure you might follow to index a document of normal report length, or of chapter length in a book, or (with adequate memory and storage) of a book length work. I am assuming that the text exists on disk, since you will have composed and formatted and printed out your work using your word processing system.

Step One

The first step is to set up an editing copy of the text, calling it INDEX1.DOC and keeping the original text intact. The original text file should then be kept in a safe place to obviate any chance of accidental corruption from the indexing process.

Step Two

You would edit INDEX1.DOC as follows:

Embed at the head of the text the printer codes for turning off the printer, the disk, the bi-directional printing, and the printer form feed. In *Peachtext*, these are: PRINT OFF, DISK OFF, BI OFF, and FORMFEED OFF.

Select a pair of markers to identify those words or short phrases you wish to include in the index, one to go before the word(s) and the other to go after. A good pair are [and], as long as you have not used square brackets in their conventional role anywhere in the text. If you have, a different pair of markers must be chosen.

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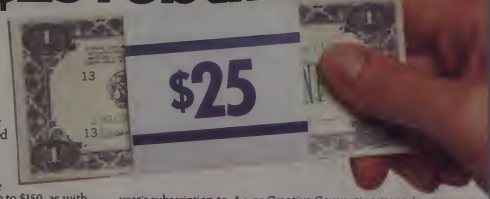

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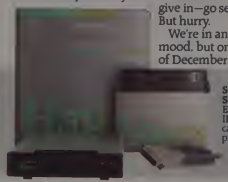

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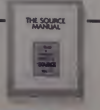

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Work through the text inserting the "for and aft" markers around the selected words, e.g.:

" . . . in the case of [Macbeth], the dramatic tension is . . . "

" . . . performed at the [Vaudeville Theatre] in 1891 . . . "

" . . . the [world premiere] took place on . . . "

If you know in advance that certain concepts, names, or phrases appear repeatedly in the text, you can mark these items with a multiple search/replace command: e.g., globally replace Nietzsche with [Nietzsche] throughout the text with a single key stroke.

If you know in advance that certain concepts, names, or phrases appear repeatedly in the text, you can mark these items with a multiple search/replace command.

Because of the various processing stages which follow, it is best to limit the number of characters between markers to a maximum of 55.

When this editorial work has been completed, you will use the global search/replace capacity of the word processing program to replace the "for-and-aft" markers with the appropriate codes to turn the "print to disk" ability on and off; it is also at this stage that you call upon the ability of the word processing package to keep track of the page number as it reads through the text.

Because you are also striving to produce a disk file which can be processed by MBasic, it is necessary to ensure that there are no extraneous commas in the items enclosed between the markers to confound the later Basic programs, and to mark off each index item by a comma from its page reference.

Using the *Peachtext* conventions, therefore, the following substitutions are made:

[=\NL,DISK ON

] =\%PAGE,NL,DISK OFF

In this instance, the NL commands are necessary because the DISK ON/DISK OFF commands require a preceding carriage return to operate. Note also the inserted comma before the command to print the page number.

Step Three

Then, END and PRINT to disk the edited text. The embedded commands will ensure that the selected index items together with their page references are printed to disk in a file which the machine will automatically call INDEX1.PRN.

This file will, of course, be sorted only in page order. If that is adequate for your needs, the index can be edited, formatted, and printed out.

It will probably be necessary, however, to edit this file to remove the formatting codes the machine automatically builds into a .PRN file of this nature (e.g. form feeds), which might otherwise interfere with later Basic processing.

Step Four

Normally, one expects an index to be arranged alphabetically. To re-order INDEX1.PRN with this in mind, you must either use a sort/merge package or devise an MBasic sorting program. The latter can usefully serve if the dimensions of the sort are not excessive, but a program like *SuperSort*, which is both quicker and more capacious, is most useful.

There is, however, at this stage a further possible snag. Some of the selected items on INDEX1.PRN will have initial capital letters and others will begin with lowercase, so that when the sorting program gets to work (using ASCII values) it groups the capitals first and the small initial letters separately. It may be that your sorting package has a built-in device for coping with this; if not, you must run the file through an intermediate Basic program which will change the initial lowercase letters into caps.

Listing 1 shows a Basic program which will process INDEX1.PRN to deal with this snag; the processed file, in which all the index items have now been awarded initial caps, is called INDEX2.PRN.

Listing 1.

```
10 OPEN "I",#1,"INDEX1.PRN"
20 OPEN "O",#2,"INDEX2.PRN"
30 IF EOF(1) THEN END
40 INPUT #1,A$,B$
50 LET X$=LEFT$(A$,1
60 IF ASC(X$)= 96 AND ASC(X$)  =
122 THEN 70 ELSE 80
70 GOSUB 120
80 PRINT #2,A$;",";B$
90 GOTO 30
100 CLOSE #1
110 END
120 FOR I=97 TO 122
130 IF ASC(X$)=I THEN 140 ELSE 160
140 LET X$=CHR$(I-32)
150 LET A$=X$ + MID$(A$,2)
160 NEXT I
170 RETURN
```

Step Five

This latter file then needs to be sorted alphabetically. If you use *SuperSort*, the entries are:

```
INPUT=60,CR-DEL
SORT-FILE=INDEX2.PRN
OUTPUT-FILE=INDEX3.PRN
KEY=#1,55,ASCEND
GO
```

If you want to build this into a more comprehensive SUBMIT file, which CP/M allows, a one-line .COM entry can be entered:

```
SORT      INP=60,CR;SOR=
INDEX2.PRN;OUT=INDEX3.
PRN;K=#1,55,ASC;G
```

Step Six

The resulting file INDEX3.PRN will then have all the index items, with their relevant page numbers, arranged alphabetically, and the main slog of the work of indexing will have been accomplished. There still remains, however, some final editing and polishing to be done, and the degree of sophistication of the final index is in direct proportion to the amount of editing you are prepared to devote to this raw list.

For example, to create a first rate index, you should replace a crude entry such as "Shaw, 86,97" with "SHAW, George Bernard (1856-1950): 86,97." This can be done using the global search/replace function of your word processor. Or where there are multiple entries for one topic, you may want to tidy it up as follows:

```
London 43
London 57
London 102
London 152
```

might be edited to read

```
London 43, 57, 102, 152
```

Or, if you want to build in more detail, it might become:

```
London
  theatres          43, 152
  society             57
  planning           102
```

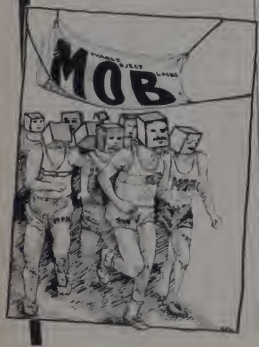
The essential thing in all this is to remember that it is your job to program the machine to do what *you* believe to be necessary, rather than be content to accept what the machine does well mechanically but what by professional indexing standards is less than adequate. ■

JOHN J. ANDERSON

In this edited excerpt from the book *Commodore 64 Sight and Sound*, we discover how much simpler C64 sprite manipulation is with Simon's Basic than with plain vanilla Basic. If you own a C64 and still do not have a copy of Simon's Basic, you are missing out on the finest implementation of Basic available for any Commodore computer.

MOBs: Simon's Basic Sprites For The C64

It would be tough for you to own a C64 very long without knowing that your machine can generate "sprites." A sprite is a piece of color screen data that can be controlled independently from the "normal" screen display. The screen data can be manipulated to move, change color, and even change shape without the need to recalculate backgrounds. Up to eight simultaneous and independent sprite shapes can be programmed in a relatively straightforward manner.



Sprites are MOBs

First of all, let's get one piece of terminology straight. In Simon's Basic, a sprite is not a sprite—it is a MOB: a movable object block. So get the word "sprite" out of your head—it is MOB from here on in.

MOBs don't care whether you display them on hi-res or lo-res screens (although you need to do a bit of extra work to get them to appear on hi-res and multi-res screens). You can display a MOB in any single color in the hi-res mode, and in up to three different colors in the multicolor mode. A hi-res MOB is 24 pixels wide by 21 pixels deep. Remember that in multicolor mode pixels are double width, so multicolor MOBs are 12 dots wide by 21 dots deep.

Before you enthusiasm takes you off the deep end, you should realize that working with MOBs can be tricky. There are many things to keep track of and dozens of ways to trip up.

On the bright side, it is much easier to deal with them from Simon's Basic than it is from plain old Basic. Simon's Basic has many special commands specifically designed to make working with MOBs as simple as possible. There is no comparison between learning to handle MOBs from Simon's Basic and controlling "sprites" the hard way.

Design

The purpose of the DESIGN command is to allocate memory space for a MOB. Before you do much else, you must tell the computer what kind of MOBs you are designing, and where they will reside in memory. The format for the DESIGN command is as follows:

DESIGN mob-res,address
where:
mob-res = 0 or 1
address = 2048 - 4095
(in multiples of 64)

The first parameter tells whether you are designing a hi-res or a multi-res MOB. If you specify 0 for this parameter, you are designing a hi-res MOB. If you specify 1, you are designing a multi-res MOB. The second parameter tells the computer where to look in memory to find this specific MOB shape.

Because each MOB uses up 64 bytes of memory, each block of available MOB memory is 64 bytes long. MOB memory starts at memory location 2048, and proceeds from there in blocks of 64. Table 1 shows a MOB memory map.

Table 1. MOB memory map.

MOB	Block	Memory Location	
0	32	2048	=2048
1	33	2048+64	=2112
2	34	2048+128	=2176
3	35	2048+192	=2240
4	36	2048+256	=2304
5	37	2048+256+64	=2368
6	38	2048+256+128	=2432
7	39	2048+256+192	=2496
8	40	2048+256+256	=2560

Things start to get a little sticky now, but try to hang on. There is a block number associated with each block of MOB storage space. In Table 1 we can see that the block numbers start at 32, which is associated with the block that

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begins at memory location 2048. Block 33 starts at location 2048 + 64, block 34 at 2048 + 64 + 64, and so on. To determine what block number is associated with any given memory location, simply divide the memory location by 64.

Let's answer a quick question probably now occurring in many minds—if only 8 MOBs can be displayed at a time, why designate so much room for MOB addresses?

Well, even though we are limited to displaying eight or fewer MOBs at a time, we may want to define many more than that. Once we do, we can change them on the fly—and this is how we animate MOBs. By switching slightly different MOBs quickly, we can make a shape appear to move: we can make a runner run and a jumper jump. Then when we move the MOBs while fipping between them, we have a bona fide moving picture. That's just one reason that we sometimes keep lots more than eight MOBs defined in memory.

Let's go back to the hard-to-digest MOB rules, which will only become clear through experience with them.

If a MOB is to be used on a hi-res graphics screen, you must add a graphics constant value of 49152 to the screen address figure. When calculating a block number, do not take the 49152 graphics constant into consideration. Merely work the calculation as usual—49152 is a flag that allows the MOB to appear on a hi-res or multi-res screen. If you forget this when putting a sprite on a hi-res or multi-res screen, you'll go nuts trying to figure out why it's not working.

The @ Command

The @ command is the header that indicates a MOB design grid is to follow. You will use a design grid to construct MOB shapes. The grid is 24 dots wide when you are designing a hi-res MOB, and 12 dots wide when you are designing a multicolor mob.

Something else important: you should ensure that each line number for the grid is the same length—for example, three digits or four digits. By doing this, you will keep the indentation of points on the grid constant and not encounter problems during the MOB design process.

When you are designing a monochrome MOB in the hi-res mode, the color code character to use when "filling in the blanks" is B. That will be the color assigned in the MOB SET command, which we will learn about just up ahead. So the @ grid for a hi-res MOB might take the form shown in Listing 1.

In this way you can get some idea of what your MOB will look like. The entire process of designing a MOB in Simon's Basic takes place on the @ grid.

CMOB

The command CMOB stands for "color MOB" and allows you to define two additional colors that will be used in the designation of a multi-res MOB. The format for the command is very simply

CMOB color 1,color 2
where:
color 1 = 0 - 15
color 2 = 0 - 15

These two parameters are the two additional colors you desire. The primary MOB color is designated in the MOB SET statement just as it is in hi-res MOB design.

When designing a multi-res MOB on an @ grid, the characters B, C, and D are used. Note that the color assignment codes don't work the way you might expect them to in multi-res: the B character now represents the first parameter of the CMOB command, the C character represents the color assigned in the MOB SET command, and the D character represents color 2 in the CMOB command. So a multicolor @ grid might take the following form in Listing 2.

MOB SET

The MOB SET command allows you to set the stage and lift the curtain on a MOB. It performs the initialization process for any designated MOB. The format for the command is

MOB SET mob priority,memory block, color,screen priority, resolution
where:
mob priority = 0 - 8
memory block = MOB indentifier
color = 0 - 15
screen priority = 0 or 1
resolution = 0 or 1

The parameter priority specifies the number of the MOB you are setting up. This number must be unique for each MOB. The lower the MOB number, the greater its priority over other MOBs. If two or more MOBs are traveling across the screen, the MOB with the lower number passes over the MOB with the higher number.

The second parameter of the MOB SET command, memory block, defines the memory block from which the MOB shape data will be taken. Use the MOB number of the block to fill this param-

Listing 1.

```
1 REM PROGRAM 105
2 REM HIRES MOB EXAMPLE
3 REM
4 REM--------------------------
100 0.....................
110 0.....................
120 0.....................
130 0.....................
140 0.....BBBBBB..........
150 0....BBBBBBBBBBB......
160 0...BB.BBBBBBBBB.BB...
170 0..BBBB.BBBBBBBB.BBBB.
180 0.BBBBBB.BBBBBB.BBBBBB.
190 0.BBBBBBB.BBBB.BBBBBBB.
200 0.BBBBBB.BBBB.BBBBBB..
210 0.BBBBBBB.BBB.BBBBBBB..
220 0.BBBBBB.BBBBBB.BBBBBB..
230 0..BBBB.BBBBBBBB.BBBB...
240 0...BB.BBBBBBBBB.BB....
250 0.....BBBBBBBBBBB.....
260 0.......BBBBBB........
270 0.....................
280 0.....................
290 0.....................
300 0.....................
```

Listing 2.

```
1 REM PROGRAM 106
2 REM MULTI-RES MOB EXAMPLE
3 REM
4 REM--------------------------
100 0.....................
110 0...BBBBBB...
120 0...BBBBBB...
130 0...BBBBBB...
140 0..BBBBBBBB..
150 0...CCCCCC...
160 0...CCCCCC...
170 0....CCCC....
180 0.....CC.....
190 0..DDDDDD...
200 0..DDDDDDDD..
210 0..DDDDDDDD..
220 0..DDDDDDDD..
230 0.C.DDDDDD.C.
240 0...DDDDDD...
250 0..DDD.DDD...
260 0..DDD..DDD..
270 0..DDD..DDD..
280 0..DDD..DDD..
290 0..DDD..DDD..
300 0.BBBB..BBBB.
```

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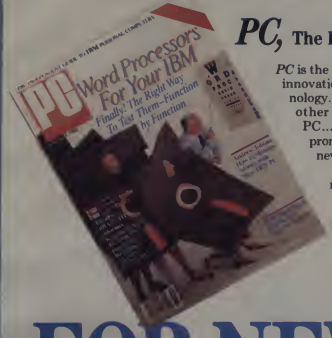

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eter. The next parameter, color, defines the main MOB color. As explained above, the main MOB color is assigned to each mob drawn with a B in the hi-res mode or a C in the multi-res mode.

The next parameter, screen priority, specifies the priority of the MOB over screen data it may encounter. Here you indicate whether you wish the MOB to pass over or under other characters or non-MOB shapes on the screen. A 0 in this position gives the MOB priority over screen data, while a 1 gives screen data priority over MOBs.

The last parameter in the MOB SET command, resolution, indicates whether the MOB was created in multicolor or hi-res mode. A 0 in this position indicates hi-res. A 1 defines multi-res.

MOBs in Motion: MMOB

The MMOB command means "move" or "manifest MOB." It allows you to display a MOB at one point on the screen and then, if you wish, move it to another location. The format for the command is

MMOB mob number,beg x,beg y, end x,end y,expansion,speed
where:
mob number = 0 - 8
beg x = legal x value for MOB size
beg y = legal y value for MOB size
end x = legal x value for MOB size
end y = legal y value for MOB size
expansion = 0 - 3
speed = 1 - 255

The first parameter, MOB number, specifies the number of the MOB you wish to display and move. Make sure this

Table 2.

0—MOB is displayed normal size.
1—MOB is displayed at double width, normal height.
2—MOB is displayed double height, normal width.
3—MOB is displayed double width and double height.

number matches the number of the MOB you set in the MOB SET command. The parameters beg x and beg y are the coordinates of the point on the screen where the MOB will be displayed before it is moved. Parameters end x and end y indicate where to finally place the MOB after movement. If you do not wish to move a MOB but just want to display it, use the same values for both start and end screen locations.

Expansion refers to the size of the MOB when it is displayed. The expansion numbers and resulting display sizes are shown in Table 2.

The final parameter is speed. This sets the speed of movement of the MOB and can be a number from 1 to 255. A parameter of 1 is the fastest speed, and 255 is the slowest movement speed attainable.

RLOCMOB

The command RLOCMOB stands for "relocate MOB," and enables you to move an already displayed MOB to a different location on the screen. Format for the command is much the same as that of MMOB, except the starting position of the MOB is already known:

RLOCMOB mob number, end x, end y, expansion, speed

The parameters end x and end y are the screen coordinates of the point to which the MOB will be moved. All other parameters are the same as encountered in the MMOB command.

MOB OFF

The command MOB OFF does just that—it turns off display of a MOB. The format for the command is

MOB OFF mob number
where:
mob number = 0 - 8

The mob number is the number of the MOB you wish to clear from the screen.

By now you probably feel buried under tons of commands, few of which make any immediate sense to you. Well, here are some programs to help you get a grip. Play with them, change them, see what makes them work and what makes them stop working. Design your own MOBs to replace the ones used here. Look at each of the commands, and remind yourself of what each does.

When you get discouraged, take a look at a sprite how-to book working from plain old Basic. Then thank your lucky stars you have Simon's Basic.

The programs in Listings 3 through 7 have been designed not for sophistication of effect, but for ease of understanding. Play with them until you catch on. ■

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Listing 3.

```
1 REM PROGRAM 108
2 REM FOLLOW THE BOUNCING BALL
3 REM
4 REM------------------------
10 DESIGN @,8192
100 @.........................
110 @.........................
120 @.........................
130 @.........................
140 @.........BBBBBB..........
150 @.....BBBBBBBBBBB.BB......
160 @...BB.BBBBBBBBB.BB.BB....
170 @..BBBB.BBBBBBBB.BBBB....
180 @.BBBBBB.BBBBBB.BBBBBB...
190 @.BBBBBBB.BBB.BBBBBBB....
200 @.BBBBBBB.BBB.BBBBBBB....
210 @.BBBBBBB.BBB.BBBBBBB....
220 @.BBBBBB.BBBBBB.BBBBBB...
230 @..BBBB.BBBBBBB.BBBB.....
240 @...BB.BBBBBBBBB.BB......
250 @.....BBBBBBBBBBB.........
260 @.........BBBBBB..........
270 @.........................
280 @.........................
290 @.........................
300 @.........................
310 MOB SET 0,128,11,0,0
320 MMOB 0,130,50,130,160,0,20
330 MMOB 0,130,160,130,50,0,30
340 GOTO 320
```

Listing 4.

```
1 REM PROGRAM 109
2 REM MULTI-RES MOB ANIMATION
3 REM
4 REM------------------------
10 DESIGN 1,8192
100 @.........
110 @...BBBBBB...
120 @...BBBBBB...
130 @...BBBBBB...
140 @...BBBBBBBB.
150 @....CBCCBC..
160 @....CCCCCC..
170 @....CBBC....
180 @.....CC.....
190 @...DDDDDD...
200 @.CDDDDDDDDC.
210 @.CDDDDDDDDC.
220 @.CDDDDDDDDC.
230 @.C.DDDDDD.C.
240 @CC.DDDDDD.CC
250 @..DDD.DDD...
260 @..DDD..DDD..
270 @..DDD..DDD..
280 @..DDD..DDD..
290 @..DDD..DDD..
300 @.BBBB..BBBB.
310 MOB SET 0,128,10,0,1
320 CMOB @,6
330 MMOB @,20,90,250,90,2,110
340 GOTO 330
```

Listing 5.

```
1 REM PROGRAM 110
2 REM MULTIPLE MOB ANIMATION
3 REM
4 REM------------------------
10 DESIGN 1,8192
100 @.........
110 @...BBBBBB...
120 @...BBBBBB...
130 @...BBBBBB...
140 @...BBBBBBBB.
150 @....CBCCBC..
160 @....CCCCCC..
170 @....CBBC....
180 @.....CC.....
190 @...DDDDDD...
200 @.CDDDDDDDDC.
210 @.CDDDDDDDDC.
220 @.CDDDDDDDDC.
230 @.C.DDDDDD.C.
240 @CC.DDDDDD.CC
250 @..DDD.DDD...
260 @..DDD..DDD..
270 @..DDD..DDD..
280 @..DDD..DDD..
290 @..DDD..DDD..
300 @.BBBB..BBBB.
301 DESIGN 1,8192+64
303 @....BBBBBB...
310 @...BBBBBB...
320 @...BBBBBB...
330 @...BBBBBBBB.
340 @....CCCC....
350 @CC.CBCCBC.CC
360 @.C.CCCCCC.C.
370 @.C..CBBC..C.
380 @.C....CC....C.
390 @.C.DDDDDD.C.
400 @.CDDDDDDDDC.
410 @..DDDDDDDD..
420 @...DDDDDD...
430 @...DDDDDD...
440 @...DDDDDD...
450 @..DDD.DDD...
460 @..DDD.DDD...
470 @BDDD....DDDB
480 @BDD......DDB
490 @BD........DB
500 @B..........B
520 CMOB @,6
525 MOB SET @,128,10,2,1
530 MMOB @,170,190,170,190,2,
    10:'MOUSE 2
540 MOB OFF @
545 MOB SET 1,129,10,0,1
550 MMOB 1,170,190,170,160,2,90
560 MMOB 1,170,160,170,190,2,90
570 MOB OFF 1
580 GOTO 525
```

Listing 6.

```
1 REM PROGRAM 111
2 REM MORE MOB ANIMATION
3 REM
4 REM------------------------
5 COLOUR 0,0
10 HIRES 0,0:MULTI 7,0,0
20 CIRCLE 70,90,30,40,1
30 PAINT 71,91,1
90 DESIGN 1,8192+49152
100 @.....C......
110 @....CCC.....
120 @...CCCCC....
130 @....CCC.....
140 @....BBB.....
150 @...BBB.BB...
160 @..BBBBB.....
170 @..BBBBB.....
180 @..BBBBB.....
190 @..BBBBBBB...
200 @..BBBBBBB...
210 @..BBBBBBB...
220 @..BBBBBBB...
230 @..BBBBBBB...
240 @..BBBBBBB...
250 @..BBBBBBB...
260 @..BBBBBBB...
270 @..BBBBBBB...
280 @..BBBBBBB...
290 @..BBBBBBB...
300 @..BBBBBBB...
301 DESIGN 1,8192+64+49152
303 @.....C......
310 @....CCC.....
320 @...CCCCC....
330 @....CCC.....
340 @....BBB.....
350 @...BBB.BB...
360 @..BBBBB.....
370 @..BBBBB.....
380 @..BBBBB.....
390 @..BBBBBB...
400 @..BBBBBB...
410 @..BBBBBB...
420 @..BBBBBB...
430 @.CCCBBBCCC..
440 @CCCCCBBCCCCC.
450 @CCC..D..CCC.
460 @CC.D.DDD.CC.
470 @...DD..D....
480 @...DDD.....
490 @..D..D..D...
500 @...D..D.....
520 CMOB 6,2
525 MOB SET 0,128,1,0,1
530 MMOB @,170,230,170,190,2,190
540 MOB OFF @
545 MOB SET 1,129,1,0,1
550 MMOB 1,170,190,170,10,2,120
570 MOB OFF 1
580 GOTO 525
```

Listing 7.

```
1 REM PROGRAM 112
2 REM OVER THE BOUNDING MAIN
3 REM
4 REM------------------------
10 HIRES 3,7
20 PRINT"[2F]:BLOCK# 0,50,320,210,1
90 DESIGN @,8192+49152
100 @.........B.B.....
110 @....BBBBB.BBB.....
120 @....BBBBBB.BBBB...
130 @...BBBBBB.BBBB....
140 @...BBBBBBB.BBBB...
150 @..BBBBBBB.BBBB....
160 @..BBBBBBB.BBBB....
170 @..BBBBBBB.BBBB....
180 @..BBBBBBB.BBBB....
190 @..BBBBBBB.BBBB.B..
200 @..BBBBBBB.BBBB.BB.....
210 @..BBBBBBBB.BBBB.BBB....
220 @..BBBBBBBB.BBBB.BBBB...
230 @..BBBBBBB.BBBB.BBBB...
240 @.........B....B.B.....
250 @BBBBBBBBBBBBBBBBBBBBBBB
260 @BBBBBBBBBBBBBBBBBBBEE...
270 @.BBBBBBBBBBBBBBBBB....
280 @.........................
290 @.........................
300 @.........................
310 MOB SET 0,128,0,0,0
330 MMOB 0,0,75,319,75,3,200
340 GOTO 330
```

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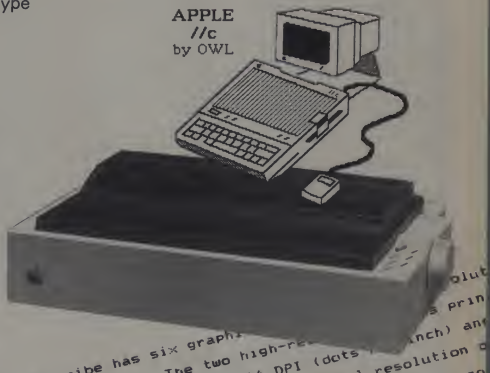
Apple Scribe, Smith-Corona D-300, and Star Micronics PowerType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resolution modes print at a vertical resolutio

The Apple Scribe is capable of printing graphics with no modications needed. An example is the illustration of Apple IIc above. The two print modes are draft quality (top sample) and near-letter-quality (bottom sample).

A stute readers may notice that I am sitting in for John Anderson, our regular Print About Printers columnist. Let me assure you that John, the reigning Emperor of Printers, will return shortly. This month we take an in-depth look at Apple's revolutionary thermal transfer color Scribe printer, the D-300 dot matrix workhorse from Smith-Corona, and the PowerType daisywheel printer from Star Micronics. Re-ink those ribbons, and let's get printing!

Apple Scribe

Along with the introduction of the IIc, Apple announced the Scribe, an innovative dot matrix printer that is capable of near-letter-quality hardcopy, hi-res graphics dumps, and color printing. This is a pretty impressive list of features at any price, but for $299 it is virtually unbelievable. Does the Scribe live up to the hype that surrounded its introduction? The answer is "unfortunately not." Read on to discover what lead to this disappointing conclusion.

The Scribe was designed to be an inexpensive, yet versatile printer for the Apple IIc. In this regard it has succeeded. The Scribe is a very attractive 14.5" x 12.5" x 6" unit that matches the aesthetics of the IIc. Hook-up is as simple as connecting the supplied cable to serial port one on the back of the IIc, and then depressing the power switch on the printer control panel. Also on the front panel are the select (on-line), letter-quality, and line/form feed switches. All are easily accessible and have appropriate status lights.

The Scribe is a "plain paper" thermal transfer printer which uses both friction and tractor feed devices to load 4"-10" wide paper. Most thermal printers have a printhead consisting of a matrix of heating elements that burn the image of characters onto special heat sensitive paper. The Scribe, however, heats its wax-composition ribbon with a vertical 24 element in-line printhead and "melts" the characters onto the paper. This method of printing is at the heart of the Scribe's inadequacy for all but the least demanding tasks.

The thermal transfer process requires very smooth paper to work best. This disallows most high quality, tex-

tured letterhead, as well as onion skin computer paper. Apple recommends any 16 to 20 pound smooth finish stock or Xerox 4024 copier paper. Thoughtfully included with the Scribe is a plastic paper tray that connects to the bottom of the printer and neatly holds a 1" stack of fanfold paper in reserve, thus decreasing the footprint of the unit.

The Scribe has two print modes, draft and letter quality, with respective print speeds of 80 and 50 characters per second. This is about par for thermal dot matrix printers. Draft mode, 9 x 14 dots per character, is good for quick-and-dirty program listings, and the letter quality mode, 12 x 15 dots, provides acceptable hardcopy for correspondence with good friends and fellow hackers, though it falls short in comparison with other "letter quality" printers (see sample printout). Two common features that increase throughput, bi-directional printing and logic-seeking, are both missing on the Scribe. It is of some compensation that the Scribe can do headline (double width) font, slashed zeros, sub/superscript, and underlining.

One of the most impressive features of the Scribe is its ability to print graphics dumps with a resolution of 160 x 144 dots per inch. When printing graphics screens created with *MousePaint*, for example, the Scribe performs well, except when the picture contains large areas of black, in which case the hardcopy reveals inconsistent density and registration problems.

To print in color, the Scribe uses a special one-pass ribbon that features three repeating bands of color: yellow, magenta, and cyan. Each band is 8" long, the width of a sheet of paper. To create colors that are not on the ribbon itself, you must overprint one color on top of another. Standard practice is to print the darker color after first printing the lighter. Also, it is most efficient to do all of your printing in the order that the colors appear on the ribbon. If you plan to do a good deal of color printing, plan to invest in a large supply of color ribbons ($9.99 each), as they last only a third as long as black ribbons ($6.99).

If documentation were judged like movies, the Scribe manual would receive an Oscar. Apple has set an unprecedented standard of excellence for documentation. The manual is divided into two parts; the first being for casual owners who wish to do simple printouts, and the second half devoted to exhaustive reference material and charts for the advanced user. Simple illustrations and explanations are found throughout this 142-page spiral bound notebook.

With the introduction of the Macintosh and IIc, the microcomputer publishing industry seems to have fallen in love with Apple. The Scribe printer brings us down to Earth and helps us realize that the hardware wizards at Cupertino are mortal—every bit as capable of making a mistake as we. If you are a IIc owner in search of a 100% Apple-compatible printer, I suggest that you save your money and purchase the $595 Imagewriter, one of the finest, most durable dot matrix units on the market. The Okidata 82a with built-in Apple routines might be a good bet too.

Smith-Corona D-300

Ladies and gentlemen, it is with great pleasure that I present to you a truly versatile dot matrix printer, the D-300 from the folks at Smith-Corona. This large 24.75" x 14.5" x 6.5" workhorse is durable enough for heavy duty use in the office, yet its relatively low

The Smith-Corona D-300 is a durable dot matrix printer which offers a wide variety of print modes and styles.

price keeps it within reach of the home user.

Smith-Corona knows how to ship a printer—the D-300 was so heavily protected in its shipping carton that it looked prepared to venture through a war zone. After unpacking the D-300, it became evident that the printer itself was a rugged unit capable of taking any abuse you could dish out. What's more, the D-300 can print out just about any style type in any mode you like.

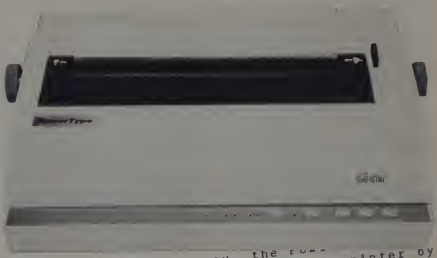
The Smith-Corona D-300 printer supports draft and near-letter-quality print, in either italics or emphasized mode. Also available are sub/superscripts and an enlarged print face for titles and headings.

This dot matrix impact printer uses a nine-pin head, the bottom pin being used for underlining. Standard draft characters are composed on a 9 x 9 matrix, and near-letter-quality characters are 17 x 18, produced with two passes of the printhead. When in normal draft mode, the D-300 spews out information at the rate of 140 characters per second. The paper slew rate is an impressive 2.7 inches per second. All this and bi-directional logic-seeking too! These features, combined with a 2K buffer, make the D-300 perform like a turbo-charged typewriter.

One of the lesser known facts about the D-300 is that in addition to its excellent text capabilities, this printer fully supports high-resolution graphics printing. Sources at Smith-Corona claim that the D-300 graphics mode is more than 90% compatible with Epson FX printers. Our tests with commercial graphics packages confirm this estimate.

The D-300 accepts both single sheet and fanfold paper and may be loaded from the back. Since the tractor mechanism is located above the printhead, fanfold paper may also be fed into the printer from beneath the unit. Due to the position of the tractor, a full sheet of paper must be advanced to remove the last printed page without ripping the document. Furthermore, the edge of the hinged dustcover is dull and not designed to tear paper cleanly. The D-300 handles paper anywhere from 3.5" to 15" in width. In its standard 10 cpi pitch, the D-300 has a maximum column length of 132 characters.

On the front righthand side of the unit is the printer control panel. Standard features such as on-line, form feed and linefeed switches are located here, as well as the paper advance and reverse index buttons that adjust the paper in increments of 1/72".



Than

A special message to you, the [illegible] printer by Sta
purchase of a PowerType Daisywheel printer with your purc
Inc. We hope you will be satisfied with your purc
enjoy all of the many features of this fine lette
printer. To assist you in accessing all of the ma
your PowerType, a complete and fully documented
Manual for the PowerType is currently being prod
forwarded to you at no charge, postage paid, mon
facilitate sending you the Final User's Manual,
that you complete and return your Warranty Regis
Star Micronics, Inc. as soon as possible. Once a
and Happy Printing!

The Star Micronics PowerType daisywheel printer supplies letter quality output at a reasonable price.

Firms Mentioned in this Column:

Apple Computer 20525 Mariani Ave. Cupertino, CA 95014 (408) 996-1010	SCM Corp. 65 Locust Ave. New Canaan, CT 06840 (203) 972-1471	Star Micronics 2308 E. 12th St. Dallas, TX 75261 (214) 456-0052

As I mentioned earlier, the D-300 is a versatile printer—it sports both a Centronics-type parallel port and a female DB-25 serial interface, both located on the back of the printer. Adjacent to these connectors are three DIP switches with which parameters such as baud rate (110 to 9600) and RS-232C protocol (Ready/Busy, X-on/X-off, ETX/ACK) can be set.

There is no denying that the Smith-Corona D-300 printer offers plenty at $795 retail. If the thought of buying two printers—a daisywheel for correspondence and a dot matrix for data processing—throws your checkbook into spasms, consider the D-300. If you can live with an 8" carriage and a slightly slower print speed, you can save yourself some money and purchase the D-200, the kid brother of the D-300.

Star Micronics PowerType

From the people who brought the world the famous Gemini-10 comes PowerType, a daisywheel printer for under $500. In the attempt to round out their product line, Star Micronics now offers this daisywheel printer for personal computer users with a need for letter quality output at a reasonable price.

Like the D-300, the PowerType boasts both a parallel Centronics-type connector and a female RS-232C serial port for easy interfacing with virtually

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Epson FX100	665.00
Okidata 84P	850.00
Okidata 92	415.00
Okidata 93	649.00

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Volksmodem 300 Baud	56.00
Mark XII	289.00
Hayes 1200	531.00
Hayes 1200B w/Smart COMM II	469.00

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Panasonic TR120G	159.00
Panasonic TR120G	169.00

PRINTERS

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MODEL	QTY	PRICE EACH	SHIPPING	TOTAL
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			5.00	
			5.00	

CIRCLE 149 ON READER SERVICE CARD

PRINTERS (CONT'D)

every popular computer on the market. For those interested in using the serial interface, the PowerType can communicate at baud rates from 150 bits per second all the way up to 9600 bps. In addition, all three standard protocols are available via DIP switch settings. By the way, the parameter-setting switches are conveniently located under the front cover which flips up for quick access.

The PowerType uses a 96-petal printwheel and hums along at a respectable 18 characters per second. Printing a maximum of 165 characters across with a condensed pitch (15 cpi), the PowerType also has a proportional spacing mode. Star Micronics claims a paper slew rate of approximately 2 inches per second, which matches the results of our tests. In addition, bi-directional logic-seeking is employed to increase further the overall throughput of the PowerType.

As supplied, the PowerType does not have a tractor feed mechanism, but one can be added at a later date if you wish.

As supplied, the PowerType does not have a tractor feed mechanism, but one can be added at a later date if you wish. Using friction feed, the PowerType accepts paper 5.5" to 13" in width. Without the sprocket device, it is impossible to do extensive printing on self-adhesive mailing labels, but the PowerType is suitable for lengthy documents once standard paper is correctly fed into the unit.

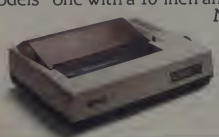
What more can really be said of a daisywheel printer? It works well, as you can see from looking at the sample printout, and functions quietly. After weeks of testing, the only negative thing I can say about the PowerType is that the documentation supplied with the printer is very "techie," not user-friendly at all. By returning your registration card you receive the professional updated owner's manual that should have been packed with the printer originally. The PowerType is Star Micronics' entry into the daisywheel business; it is an affordable letter quality printer suitable for both personal and business uses. Congratulations Star Micronics. Not bad for your first shot. ■

Now you can get personal with a Datasouth.

Say hello to the Datasouth Personal Printer—an office-quality dot matrix printer that makes itself right at home next to your personal computer.

Technically speaking, the Personal Printer is "Epson compatible." But it's better than the competing Epson because it also does near-letter-quality printing.

Personally speaking, the Personal Printer is "checkbook compatible." So you don't have to sacrifice the money you need to get the printer you want. And it comes in two models—one with a 10-inch and one with a 17-inch carriage.



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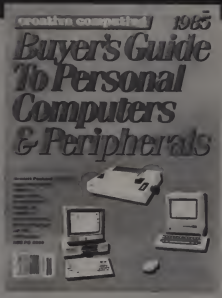

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JOHN J. ANDERSON

NOTEBOOK COMPUTING

Olivetti M-10, Text Power 100, Remote Control, and two applications

The Olivetti M-10 lap portable computer and PL microplotter.

Jingle bells, jingle bells . . . oh, hello there. It is once again my pleasure to be your host in the wonderful world of creative but portable computing! Delete all those spurious files taking up precious RAM in your notebook machine and make room for some good stuff to follow.

Dashing through the snow . . .

Olivetti M-10

You may or may not know by this time that I am positively fanatical about my Model 100. I've had the opportunity to carry around lots of portables, and the Model 100 has always been the machine of choice. It is light, truly portable, able to telecommunicate without muss or fuss, and is perfect for tapping out first drafts (like this one).

HARDWARE PROFILE

Name: Olivetti M-10 **Type:** notebook portable **CPU:** 80C85 **RAM:** 8K, expandable to 32K, CMOS **ROM:** 32K **Keyboard:** full-stroke, with 8 function keys **Display Resolution:** 40x8 text, 240x64 graphics **Ports:** Parallel printer, RS-232 serial, modem, bar code reader **Dimensions/wt:** 12"x8.5"xZ", 3.5lbs **Documentation:** Acceptable, though not os good as documentation for the Model 100. **Summary:** With a few reservations, a most impressive mochine. **Price:** $799 (8K version)

Manufacturer: Docutel/Olivetti
5615 Highpoint Dr.
Irving, TX 75062
(214) 258-5400

Now imagine a Model 100 with a tilt-up screen—a screen that is about as easy to see and work with as any LCD is ever likely to be. That is the first impression I had of the Olivetti M-10. It is no secret that the Model 100, NEC 8201,

and Olivetti M-10 are all manufactured by Kyocera, and are all quite similar under the skin. On the M-10, all the same software as the Model 100 is there in ROM, as is the internal modem, and every other major feature of the Model 100. I was impressed. Finally the bothersome problem of positioning the machine for optimum viewing had been surmounted.

Upon turning the pretty baby on, I was again pleasantly surprised. The display font has been slightly improved and is easier to read. The plastic bezel is also removable, so in the unthinkable event that it is scratched, it can simply be replaced. More good thinking.

Keyboard feel is also improved, and all traces of wobble have been eliminated. In the numeric mode, only the numeric keypad is enabled—no alphabetic characters can register. Neat.

Turn it over, and an extra hatch is visible. It opens directly over the RAM board, where a couple of CMOS sockets are placed. This means you can upgrade to 32K without losing your machine to service people. I dropped in a chip and went from 24K to 32K in a matter of seconds. Terrific. I always felt memory upgrade was a rather unnecessary hassle on the Model 100.

So much for loyalty. In a matter of minutes I was ready to lend out my Model 100 to Editor Linzmayer and consummate my love affair with the Olivetti M-10 by moving all needed programs and text files over to it. Trial by usage, as they say.

Imagine my surprise when problems set in. Machine language files would load, but they wouldn't operate properly. Basic programs with recourse to POKE commands (such as the one presented up ahead) were also flaked out. I couldn't believe it. How could two machines that seemed identical turn out to be highly incompatible?

I was ready to lend out my Model 100 to Editor Linzmayer and consummate my love affair with the Olivetti M-10 by moving all needed programs and text files over to it.

Since the bulk of my portable work consists of text editing, I was more or less willing to slough the problems off. With a business trip in the offing, I packed the M-10 into my shoulder bag and headed for the airport.

At 35,000 feet, I finally started typing on the M-10. It certainly cut a rakish profile on my tray table, evoking oohs and ahs from those around me. After about five seconds of tapping, however, I had to take a hard look at the keyboard.

Horrors! The M-10 keyboard is not set up Selectric-style. That means that quotation marks are SHIFT-2, an apostrophe necessitates a SHIFT-7, and other sundry aberrations. The CONTROL key is poorly placed as well.

After a bit of on-the-spot operant conditioning, I was able to grow somewhat comfortable with the situation—after all, I was weaned on Atari, Apple II, and Commodore keyboards. But as soon as I got home, it was back to the tried and true Model 100, where an apostrophe is right where it belongs: at the immediate disposal of your right pinky.

The M-10 is a very nice machine, though I fear for it. Keyboard and compatibility problems with the consanguine Model 100 and NEC 8201 will hurt it in the U.S. marketplace. It is also considerably more expensive than its two brothers, though that may change soon. If Docutel were simply to redesign the keyboard, I could recommend it wholeheartedly to those who use a portable simply for text editing.

I hear the unit is selling very well in Europe, and I can believe it. On the basis of the screen alone, it is worth a look. One thing that has always bothered me about the Model 100 is how tight the black border around the screen butts the top line of the display. No such problem exists on the Olivetti version, and once the screen is tilted into position it is much more easier to view than the Model 100, even when the 100 is propped on a book or on a set of pencil tops. And in case you are wondering, the 26-3805 acoustic cups available for the 100 (for use in hotels and other spots where modular phone jacks are not available) works just fine with the M-10.

Text Power 100

For more than a month now, I have been promising Bob Covington I would look at the program *Texi Power 100*. Truth is I haven't had much need for a text formatting program for the Model 100, since I always upload draft copy to another machine for revision (used to go to an Apple II, now the Mac). When I did need a formatter, Dave Ahl's from the September 1983 issue did the trick, though since it is in Basic, it is rather slow. I tend to be rather fanatical about conserving RAM, anyhow; I'd rather have even the extra 4K a formatter might take up for text files. The commercial formatters I've seen take up too much space and offer too little utility.

SOFTWARE PROFILE

Name: Text Power 100 **Author(s):** Hugo Ferrayra **Type:** text formatter **System:** TRS-80 Model 100, NEC 8201 **Format:** Cassette **Summary:** best of its kind **Price:** $49.95 ($59.95 for DVI version)
Manufacturer: Covington Group
310 Riverside Dr.
Suite 916
New York, NY 10025
(212) 678-0064

***Text Power 100* is the best formatter I have seen for the Model 100.**

Bob promised me that his was different and told me he would buy me beer for the rest of my life if I disagreed. What a motivator this guy is. I finally located a cassette recorder cable and loaded up *Text Power 100*.

Fortunately for the size of my ever-expanding gut, Bob was right. *Text Power 100* is the best formatter I have seen for the Model 100. As an all-machine language program, it takes up just 2507 bytes and packs an amazing amount of power into that small space. Written by Argentine programmer Hugo Ferreyra, it is a model of elegance and utility.

The function keys are reprogrammed to handle all major functions with a single keystroke and without recourse to cryptic command codes. Control of the program is logical and consistent. You order it preconfigured to operate with one or more printers.

Here is a list of some of the best features of *Text Power 100*:

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Imagine your computer:

- waking your family in case of a fire and turning the lights on for a safe exit.
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- switching on the hall lights when your children get up at night and turning them off when they forget.
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CIRCLE 137 ON READER SERVICE CARD

• Vertical centering: allows you to center your letter vertically on the page without guesswork. Default top and bottom margins are restored after printing.

• Merge: allows you to mix text from different files to create form letters, print mailing labels, and append text files.

• Edit: allows you to exit directly to the specified text file to continue editing. You then return to *Text Power* on the f8 key. This gives you the feeling that TEXT and *Text Power* are working together rather than separately.

• Page Plot: allows you to view a graphic representation of each page of a document before it is printed, with a line count displayed for each page.

Text Power 100 also has page numbering, page preview, headers, footers, horizontal centering, right justification, and settable page breaks. It will work with as few as 256 bytes of overhead. Control codes offer full control over a specified printer, including boldface, italics, super-and subscripts, underline, and other functions. Control codes are not displayed during preview, nor do they affect word-wrap or right margin justification.

Wondering about its speed? *Text Power 100* formats in excess of 5000 characters per second. That's about 1000 times faster than the Basic formatter I had been using.

When displaying a file formatted wider than 40 characters, the program uses inverse characters below the original line to denote the over-40-character portion of the line. Of course, the left margin is ignored during display to maximize display size.

I was impressed enough by *Text Power 100* to leave it in my Model 100 permanently, and redrafting on the Model 100 now seems much less formidable. And though it won't work on an Olivetti M-10, I'm told it works just fine on the NEC 8201. The program is from The Covington Group and lists for $49.95 (DVI users can order a disk version for $59.95). Remember to specify your printer(s) when ordering.

Kensington Remote Control

Of course there is no real substitute for interfacing your portable to a desktop machine on which you can revise text files using a legible 80-column display. Using the RS-232 port, I can dump files from the Model 100 to just about every other machine in the lab.

Kensington Microware has taken the serial interface approach quite a bit further and with the introduction of *Remote Control* has integrated the software environments of the IBM PC and Model 100 or 8201.

When you load *Remote Control* on your IBM PC, you have an integrated text editing and communications environment. You no longer have to switch between word processing and telecommunications programs. The software is modeled after TEXT and TELCOM as they appear in the Model 100. Using the supplied null modem cable, you can move files at high speed between a portable and a PC.

But the most useful feature of *Remote Control* is the host mode: it allows you to communicate with and control your PC using your portable, from any location near a phone line. You can move files, execute DOS commands, even run stand-alone programs from your remote site as if you were sitting in front of the PC. *Remote Control* answers the phone and hands over the reins. You can scan your disk drives for messages, upload messages to the host, even send files to the host printer.

The package lists for $180.

SOFTWARE PROFILE

Name: Remote Control **Type:** text editing/telecommunicotions pockage
System: IBM PC/ Model 100 or NEC 8201
Format: Disk **Summary:** Will oppeol to owners of both mochines **Price** $180
Manufacturer: Kensington Microwore Ltd.
251 Pork Avenue South
New York, NY 10010
(212) 475-5200

Password Protection

Have you ever had your portable molested while you weren't around? Ever come back from lunch only to find that mysterious damage occurred while you were on your second martini? Well sad to say, shenanigans of that sort have been known to go on at the lab, and I have been upset about it on more than one occasion.

Listing 1 is a Basic program that password protects your Model 100 from prying guys. Upon power-up, the unit prompts for a password. You have exactly three tries to get it right and proceed to the menu. Otherwise, the unit displays a curt admonishment to the unauthorized user and powers itself off. And that is that.

I used a variation on this theme for some time, but it had a fatal flaw—the break key was not properly disabled. That meant that a calculated or lucky keypress of SHIFT-BREAK at the right

Listing 1.

```
1 'MODEL 100 PASSWORD PROTECT
2 'by John J. Anderson
3 'Thanks to Mark L. Kushinsky
4 'Compuserve Model 100 SIG
5 '(c) 1984 Creative Computing
10 POWEROFF,RESUME:POKE 63056,120:CLS:PR
INT:PRINT"MODEL 100 ONLINE--";DAY$;"  ";
DATE$;" ";TIME$;
20 PRINT"----------------------------
---------";"ENTER PASSWORD:";
30 BEEP:B$=".......":A=0
40 A=A+1:A$=INKEY$:IF A$="" THEN 40
50 A=A+1:A$(A$,A)=A$:IF A<8 THEN 40
60 IF B$="password" THEN POKE 63056,0:ME
NU
70 X=X+1:PRINT:PRINT:NEGATIVE LOG-ON--";
:IF X<3 THEN PRINT"TRY AGAIN:";:GOTO 30
80 BEEP:PRINT"SYSTEM ACCESS DENIED":DEE
P:FOR P=1 TO 250:A$=INKEY$:NEXT P:BEEP:G
OTO 10
```

time would subvert all the planned security and drop you right into unprotected Basic. Then, with some thanks due to an upload from Mark Kushinsky on the Model 100 SIG of Compuserve, I was able to find a workable starting point.

Listing 1 is the result of my efforts. Line 10 disables the BREAK key and displays the power-up line. The POWEROFF command at that position creates a solid loop, as we shall soon see, to make sure security remains tight.

Lines 20 through 50 allow for entry of a password. The reason we can't use an INPUT$ or LINE INPUT to gather in the password is because neither command will accept a BREAK key as input—rather they treat it as a true break. As a result, we have to set up a bit of a kludge using the command INKEY$. We set up a dummy string and gather the individual key inputs into it.

At line 60, we compare user input to the actual password. If we get a match, we re-enable the BREAK key and move to the menu. If things don't match, we move ahead.

Line 70 counts the number of times the user had tried to log-on. He gets three tries, looping back to line 30. On the fourth try, we move ahead yet again.

Line 80 is the bye-bye. The user has run out of chances to get the password right. He gets the "access denied" message, and the Model 100 turns itself off. The FOR/NEXT loop gives the user time enough to read the message and clears

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the keyboard buffer in the process. We don't want to store any superfluous keystrokes prior to powering down.

At the end of line 80, we loop back to 10, where we encounter the POWER-OFF,RESUME command. It is this placement that smoothly reruns the program if the user chooses to power-up again. By setting up the loop this way, we can create a secure environment without recourse to an IPL command.

So you can power back on, if you're smart enough, but you get only one try on each power up after the initial round. Nasty beeps plague failure, encouraging unauthorized users to give up.

Save the program as PW.BA. If you want to install the password program permanently, you can do so by typing IPL"PW.BA" from Basic. Then every time you power up, the machine will default to that program.

Note, however, that no IPL call of any kind is necessary for the program to do its job. For my needs, the password program need only be invoked once in a while. It would be an annoyance to default to it every time. As it stands, all you need to do is run PW.BA, and it will operate securely.

To change the password, alter the leading equation in line 60. You can change the length of the password, too. Make sure you size B$ in line 30 to the correct length and change the value of A in the IF/THEN that appears at the tail of line 50. It should, of course, equal the length of the new password. Because "password" is eight letters long, we say IF A < 8 as it stands.

Remember that a little knowledge is a dangerous thing. If you disable the BREAK key and have not established another exit from a BREAK-disabled loop, only a cold start will break you out. So be careful. I always encourage experimentation, but caution as well.

Remote Control allows you to communicate with and control your PC using your portable, from any location near a phone line.

Mailbag

Here is a very nice letter from Susan Stevens, of Snyder, NY:

"I have been a regular reader of your column on notebook computing since its inception last November. You convinced me that I had made the right decision in purchasing the Model 100. Your coverage of uses for the machine is excellent. As a thank you, I offer a specific application for users of the 100 who have irregular and demanding schedules (don't we all)."

"I have found that the SCHEDULE program in ROM is largely neglected by most users. The program offers a powerful application that you can make work for you—time management.

"In a NOTE.DO file, enter every appointment you are obligated to keep. Identify each with a date and time. The

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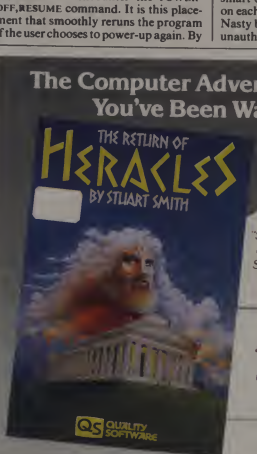

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SCHEDULE program uses NOTE.DO data to find specific appointments.

"Next, create a new file called WEEK.DO. This will serve as a reference for the current week. Divide this file into days, each separated with a visual marker, such as a row of stars.

"Each Friday, transfer your commitments for the next week to the WEEK.DO file, using the copy/paste

The SCHEDULE program offers a powerful application that you can make work for you—time management.

functions to enter all commitments on the appropriate days. Add an area at the end of the WEEK.DO file which identifies short-term projects which you expect to complete that week. Add an area following to list long-term projects you will work on that week. Having a visual record of your commitments, you can now assign time to both short-term and long-term projects. Identify time-slots for each project and add a brief comment concerning your goals for that time slot.

"You will end up with a concrete shape for the upcoming week. There are appointments to keep, projects to complete, and projects that can be delayed. Of course your objective is to complete

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all self-assigned tasks during the current week, but the priority system allows for flexibility. You can use the SCHEDULE program when making appointments (what morning do I have free during the next two weeks?), discover blocks of time to be put?), discover blocks of time to be put to good use, and ensure that you'll meet all high priority commitments.

"I have used this procedure while setting up a new business, with all the essential detail such an enterprise requires. I have not missed an appointment yet—and most important, I feel in control of my time.

"Thank you again for the guidance and direction your column has provided."

Next month, a preliminary report on Data General's entry into the personal computer fray—with a portable, of course. Til then, on Dancer! On Prancer! ■

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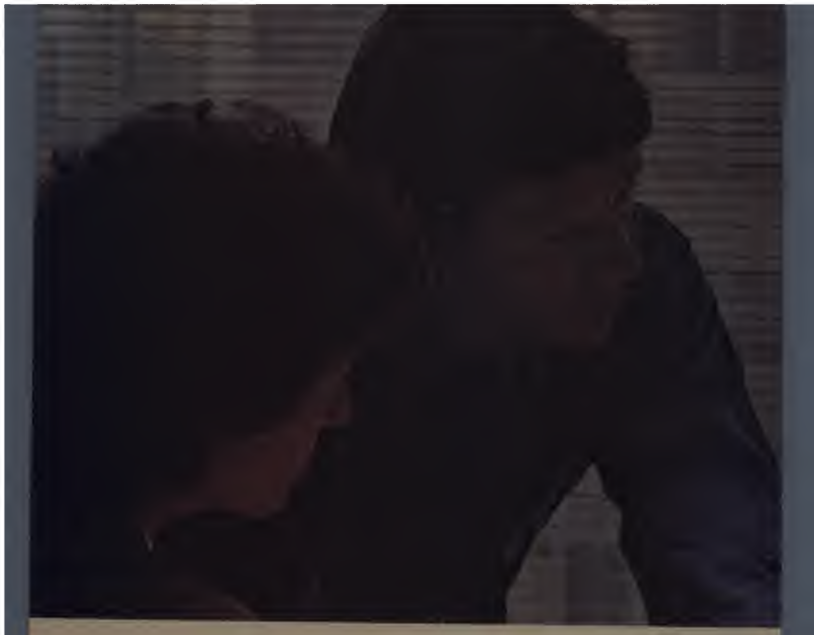

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BRIAN J. MURPHY

TELECOMMUNICATIONS TALK

Books for a Telecommunicator's Christmas Stocking

December is rolling around and the time has come to build a fire on the hearth and curl up with a few good books.

I was asked by my editor at Creative Computing Press the other day if I wanted to write a book on telecommunications as a followup to *Sorcerers and Soldiers* ($9.95 at leading bookstores everywhere). He couldn't have picked a worse time to ask. At the time there were no fewer than five telecommunications books sitting on my desk waiting to be reviewed.

This led me to two conclusions:

1. There was no opening in the market for a telecommunications book by me.

2. I had better hurry up and review those books before the dust on them got any thicker.

Actually, I intend to review six books in this month's column—books that detail just about every aspect of telecommunications, books that will be especially helpful both to new hobbyists and to those wishing to expand their existing understanding. Here goes.

The World Connection

The World Connection (Howard W. Sams & Co., 142 pp., $9.95) is written by 16-year-old Timothy Orr Knight with more wit and perception than anyone his age has a right to display. He presents the material in a very organized manner and explains the nuts and bolts of telecommunications clearly and concisely.

Knight starts by discussing the benefits of telecommunications and the possibilities they open through bulletin boards, info utilities and person to person communications. In the second chapter he plunges into basic terminology, explaining it very simply and clearly.

He discusses the information utilities, CompuServe and The Source, in Chapter Three ("The Big Guys"), describing what you have to do (and pay) to subscribe and what the services offer. In the following section, he examines the delights of logging onto local bulletin board services. A sermon on the evils of home computer piracy and unauthorized access follows.

The hardware chapter is a very general overview of modems and terminals containing a "what to look for" section and reviewing a few units like the Novation CAT and D-CAT, Hayes Smartmodem, and Radio Shack Modem I and Modem II.

Knight makes comparisons of the units easy by numbering the advantages and disadvantages of each, setting them off from the text so they can be found easily. He does not use the same technique of presentation in his chapter on communications software. This section, which looks at such programs as *VisiTerm, Smart-80, Modem 80,* and *Super> > Terminal*, is, unfortunately, the weakest chapter in the book. Knight virtually ignores software for systems other than TRS-80 and devotes too little space to his criteria for judging software.

Overall, the book is a good introduction to telecommunications, but it is hardly as comprehensive as one would hope—even for an introduction to the subject. Its main strength is that it takes a non-technical approach, keeping the material accessible to the average reader.

The First Primer

Jim Cambron's *The First Primer of Microcomputer Telecommunications* (TAB Books, 154 pp., $10.25) is a more detailed introduction to the field, designed to give the reader a "from the ground up" understanding of computers and how they communicate with each

other. After the obligatory first chapter introducing the world of telecommunications activities, there follows a chapter on how computers work. To put it simply, we've seen better explanations. The chapter is cluttered with cartoons and illustrations (as is the whole book). They do very little to clarify the material and actually make it harder for the eye to follow the text. If you stick with it, however, you will find that most of the essentials are in the text and are explained with reasonable clarity.

The hows and whys of the RS-232C serial interface consume all of Chapter 3. For most of us, it is enough to know whether or not our computers have a serial interface and what cable we need to connect a modem to it successfully. Knowing how one works is not a precondition to using a modem, but understanding the function can't hurt. Luckily, Cambron's explanation is interesting and ably presented.

In the following chapter, Cambron briefly describes how a modem works, the various standard transmission/reception speeds and the hardware formats. Unfortunately, just as he is beginning to roll, there comes a chapter on ASCII characters and control codes, which would better serve as an appendix. My advice is to skip it for the moment and go on to Chapter Six, which describes how communications software works and the kinds of features you should look for.

The book concludes with chapters on the information utilities, bulletin board systems, and alternate long distance systems. A final chapter on legal aspects of telecommunications discusses data transmission surcharges made by Southwestern Bell and aspects of the law regarding libel and slander charges arising from telecommunications. In the Appendices you'll find charts reviewing the relative merits of communications software and a brief run-down of some of the features of the more popular modems.

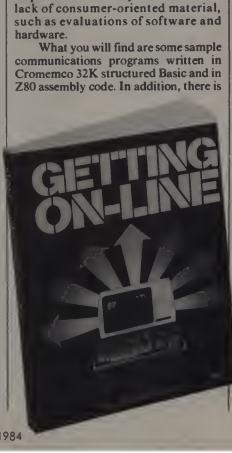
In judging this book you must bear in mind that it is a primer. It does not pretend to be a comprehensive treatise on telecommunications. As such, it is enough of a glimpse of the field to give prospective telecommunicators the information they need to decide whether or not to make a start in the hobby.

Micros and Modems

A much more technically oriented telecommunications primer is *Micros and Modems: Telecommunicating with Personal Computers* (Reston Publishing Co., 168 pp., $16.95) by Jack M. Niles. This book covers much of the same ground as the first two volumes described above. The difference is a heavier emphasis on the theory and almost total lack of consumer-oriented material, such as evaluations of software and hardware.

What you will find are some sample communications programs written in Cromemco 32K structured Basic and in Z80 assembly code. In addition, there is a discussion of the principles and techniques for programming your modem. The book also discusses file transfers, networking, and business applications in some detail, and the entertainment possibilities in very little detail.

There is a lot of meat for you to chew on here. This book is perfect for those who are serious about telecommunications as a hobby and who have a strong "do-it-yourself" streak when it comes to software.



Getting On-Line

Getting On-Line (Prentice-Hall Inc., 306 pp., $14.95 paper, $21.95 hardcover) by M. David Stone is the best-written of the primers I've seen. Stone's presentation is the most organized of any of these books, and his writing is uniformly accessible for even the most non-technical readers.

Stone uses his hardware chapters to expound the basics of "smart" and "dumb" terminals, using specific systems sparingly as examples. He also demonstrates how specific software packages configure micros as smart and dumb terminals.

The software section ends with five mini software reviews, exhaustively examining the capabilities of representative packages and detailing the advantages of each. This is followed by a listing of 41 terminal programs accompanied by brief descriptions and the addresses of the makers.

Next, Stone turns back to hardware, first describing how the RS-232 interface is used to connect with a modem. Then he offers capsule descriptions of five popular terminals and 30 computers.

The hardware section ends with mini-profiles of five modems. Stone discusses the features of a few of these units in great detail. He then offers a directory of 85 different modems, with information on price, format, baud rate, and RS-232 connectability.

The rest of the volume discusses the use of information utilities, on-line reference databases, and other accessible services.

Getting On-Line has my recommendation. It is clear, un-padded, attractively presented, well-organized, and exhaustive in almost every category. Of the six books reviewed here, it is my choice for my own personal reference library.

Going On-Line With Your Micro

Lou Haas's *Going On-Line With*

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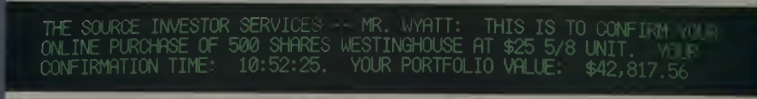
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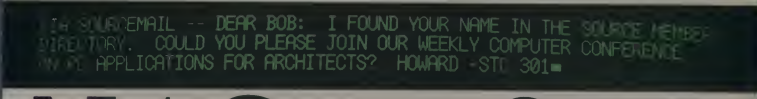
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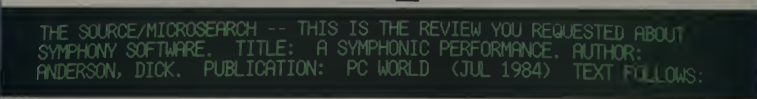
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Your Micro (TAB Books 248 pp. $12.50) is of interest if you don't want to be bogged down with a lot of material on starting up a system, but want to get right to calling up some BBS systems and info utilities.

A very large section of the book (pages 30 to 69) is devoted to listings of local BBS names and numbers. Another large section deals with how you talk to a BBS once you have it on line.

Haas includes the usual material on hardware and software, which is clearly written, if not comprehensive. The best things about this book are that it is fun to read and it approaches the topic from a novel direction.

Your Own Computer Bulletin Board

The next logical step after you have exhausted the possibilities of phoning host computers is to become a sysop and turn your own system into a host. *How To Create Your Own Computer Bulletin Board* (TAB Books, 214 pp., $12.50) by Lary L. Myers is a good primer for the would-be sysop who needs to know the basics of hardware and software. Myers' book is basically a collection of his own programs for setting up a bulletin board, and most of the volume is dedicated to Basic program listings which he explains carefully. There is a complete TRS-80 BBS program and one for Apple, as well. There are also communications programs for the LTERM smart terminal and the Heath H-89 terminal.

This is the ultimate do-it-yourself book for the prospective sysop. My only regret is that Myers didn't include a listing of the manufacturers of pre-programmed BBS software so those daunted by the copying of so much code would have an alternative.

Next Time

Next month I'll have some general news from the telecommunications world plus a listing of some of the interesting downloadable data and text files from the *Creative Computing* CompuServe Sig. Soon we'll be taking a trek across North America to get the flavor of some regional BBS systems. Aloha. ■

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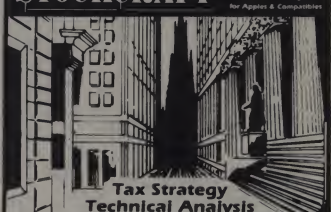
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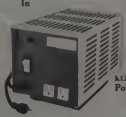
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OWEN LINZMAYER

APPLE CART

Using a parallel printer with the IIc, an RGB interface, a speed-up card, and the problem with modems

Hamlet parallel printer interface for the IIc.

We are still recovering from our 10th anniversary party issue; lots of glasses to wash, ashtrays to empty, confetti to sweep up, etc. But, the column must go on! Throwing caution to the wind and ignoring our hangovers, we rush full steam ahead with this month's column. So belt back a few aspirin, open your eyes, and pay attention, we have plenty for you to read.

While I was writing my review of the Apple IIc (October 1984), third-party manufacturers were announcing IIc-specific products that seemed promising at the time. Many of these have yet to be released, but here I take a look at several that have managed to reach our Morris Plains offices. Stepping up on the soapbox, I discuss a hardware problem (and solution) concerning the IIc. Joining me for this installment of Apple Cart is the father of *Creative Computing*, David Ahl.

Hamlet Serial to Parallel Printer Interface

For many, the Apple IIc signifies a retreat into the past. Most hardware lovers lament the demise of the expansion slots. Others contend that it was a mistake for Apple to offer a serial printer interface, now that parallel printers are all but the de facto standard. "Serial is fine for communications," antagonists claim, "but slow and outdated for printer interfaces." Eager to capitalize on such sentiments, several hardware manufacturers have put serial to parallel interfaces on their drawing boards. At the time this issue went to press, only one company had actually released a finished product: the Hamlet, from Belkin Components.

Prior to receiving the Hamlet, I had thought about what I would expect of a serial to parallel adapter. The unit should be small and simple. It should make the computer think that it is operating a standard serial printer without requiring any software patches or commands. It should connect to any parallel printer with no problems. The Hamlet has all of these characteristics.

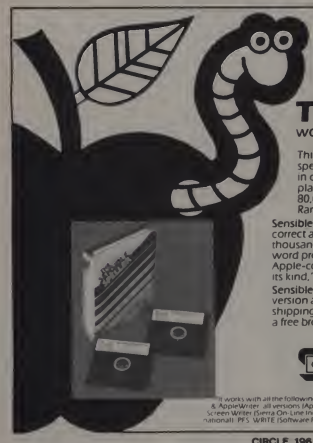
The Hamlet comes with a short users' guide and an AC to DC adapter. The interface itself is a 4.25" x 3.5" x 1" metal box with a cable dangling from either side. To attach the Hamlet to the IIc, you simply plug the serial cable into the 5-pin DIN serial port 1 of the IIc. With the hardwired Centronics cable connected to your parallel printer, you must determine whether you need to use the voltage adapter. If your printer supplies +5 volts on pin #18, as is standard, then the adapter is not needed. However, some printers do not provide this voltage and require the AC adapter for operation of the interface.

Little more can be said of the Hamlet interface other than it works with every parallel printer we have in the office. As far as the IIc is concerned, it thinks it is operating with an Apple Imagewriter printer in the text mode. Currently, the Hamlet is not designed to accommodate graphics, but Belkin Components is working on an advanced interface that will not only convert serial signals to parallel, but also allow the printer to mimic an Imagewriter.

There are other serial to parallel interfaces available from other sources offering advanced options such as print buffers and real-time clocks, but these features may be superfluous depending upon your particular needs. Priced at $98.50, the Hamlet opens up a world of printer alternatives to the recommended Apple Scribe (see "Print About Printers," this issue).

Slow Serial On IIc

Shortly after certified Apple developers received prototype IIc's for use in designing software and hardware, a small problem with the serial interface



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surfaced. Modem manufacturer Hayes explains that "serial ports on the original version of the Apple IIc operate 3% slower than specified. This significantly exceeds the operating range set forth in the Electronic Industries Association standard RS-404. As a result, 300 baud modems connected to these ports also operate slower, and the probability that transmission errors will occur is increased."

The Sakata RGB interface card improves the video quality of the Apple IIe by removing the extraneous colors that occur during color transition in lo-res and in mixed mode text.

A call to Apple headquarters in Cupertino quickly confirmed that there is indeed something rotten in the IIc. According to Apple, the EIA standard allows for plus or minus 2% variance from the standard interface speed. The IIc, they say, operates 2.9% slower than specified. However, they contend that most systems can be configured to operate correctly and that your local Apple dealer will attempt to do just that, free of charge. If unsuccessful, the dealer will file a request for a free board swap, at which time Apple can authorize him to replace the IIc motherboard with a modified board. Apple IIc computers manufactured after December of 1984 will have a revised motherboard.

Sources at Apple tell me that the problem lies with a certain crystal in the serial interface and that they entertained the idea of asking dealers to perform hardware modifications on IIc boards, but decided to go the replacement route because it is more convenient.

The question arises, "what will Apple do with all of those bothersome boards?" Executives predict that only 4% of the installed base of Apple IIc's will be swapped. My own experience has me betting that that number is far too low. True, my Signalman Mark XII modem operates wonderfully at 300 baud, but the variance problem is magnified so much at 1200 baud that I can not even log on to CompuServe at the high speed.

Apple probably arrived at this low return rate by estimating that only a few people will ever use modems, and of these, a large percent will purchase Apple modems, which operate fine even under these adverse conditions. Furthermore, of those who buy third-party modems, most will choose 300 baud units that can be successfully configured to work. I still can't help but wonder if Apple will be inundated with defective IIc motherboards.

Apple should be commended for arranging this board swap program. Anything else would have been an insult to its customers. As you may know, IBM announced that all PCjr owners can bring in their sales receipts and get free full-stroke keyboards to replace the much-maligned Chiclet keyboards of old. I never thought I'd say it, but it warms my heart to see Apple follow Big Blue's example. Good move Apple.

RGB for IIe and IIc

Both the IIe and IIc are capable of producing 80-column text displays that are perfectly legible on monochrome monitors, yet are reduced to incomprehensible smears of glowing phosphor on color monitors. There are two ways to enjoy hi-res color displays and 80-columns of text. One solution is to purchase a monochrome monitor for text and a second color monitor for graphics. The alternative to this is to buy an RGB adapter and an RGB monitor.

Simply defined, the initials RGB refer to the red, green, and blue electron guns of a color monitor. RGB technology controls each gun separately, instead of encoding them into one composite signal as do conventional NTSC color monitors. RGB monitors are inherently of higher resolution than composite monitors and provide sharply defined characters and crisp pixel graphics displays. The biggest drawback to RGB monitors is that they are expensive—a typical unit costs upwards of $450, compared to $325 for color monitors, and $150 for monochrome displays. To use an RGB monitor with your IIe or IIc, you must first purchase a video interface board, two of which are reviewed below.

From Sakata comes the XP-7 80-column/RGB card for the Apple IIe. This card not only gives you the capability to display 80 columns of text but also offers new video modes and allows you to interface the IIe to an NTSC (composite) or RGB monitor or both.

The Sakata card plugs into the auxiliary slot of the Apple IIe, thus disabling whatever is in slot 3. The RGB signals are available on the female DB-15 connector that is attached to the board via a 6" ribbon cable. After plugging in the board, all you do is select the default text color by setting the two DIP switches on the card itself.

While in the text mode, Sakata's card simulates different color monochrome monitors. You can select amber (red), green, blue, or white text. Regardless of the mode you are in, inverse characters will always be done in white to accentuate the highlighted text.

The Sakata RGB interface card improves the video quality of the Apple IIe

Video-7 RGB video interface for the IIc.

by removing the extraneous colors that occur during color transition in lo-res and in mixed mode text. The card not only displays normal graphics, but offers several new modes:

80-column text

16-color lo-res with option of mixing 40-column text

16-color lo-res with option of mixing 80-column text

6-color hi-res with option of mixing 40-column text

6-color hi-res with option of mixing 80-column text

These additional modes may be engaged by the use of simple software commands. The much talked about double hi-res graphics of the IIe can be displayed using the RGB interface if you first set the correct software hooks. The manufacturers of the Sakata card state that Apple has adopted their method of RGB interfacing as the official standard. In fact, Apple should have already introduced its own RGB monitor by the time you read this.

Apple IIc owners can also join in the RGB festivities thanks to the Apple IIc RGB interface from Video-7, the OEM of the Sakata card. The Video-7 interface box for the IIc offers every feature of the Sakata board, contains a few more graphics modes, and is better documented to boot. The interface is a small white box about the size of a pack of cigarettes. It attaches to the IIc via the video expansion port on the back of the computer, and the monitor cable connects directly to the box. The DB-15 connector of the RGB interface is 100% compatible with Apple III RGB output. If you are using an IBM-compatible RGB monitor, you need a special adapter, called the Grappler, also available from Video-7. Worth mentioning are the demonstration/diagnostic disks that accompany each RGB interface. These contain hi-res graphics slide shows, as well as sample uses for the new video modes.

If you are ready to give up using your television set as a display, or sick and tired of monochrome graphics, then consider getting an RGB monitor and adapter. Both units reviewed here are of the highest quality and are now the accepted standard for Apple RGB output.

Before handing off the column to Dave, let me wish you all the very best holiday season, and here's hoping you find that perfect peripheral stuffed in your stocking. It's all yours, Dave.

If you are ready to give up using your television set as a display, or sick and tired of monochrome graphics, then consider getting an RGB monitor and adapter.

M-c-T SpeeDemon

The M-c-T SpeeDemon is a card for the Apple II, II+, and IIe that substantially speeds up the operation of the computer. It achieves its speed improvement by actually putting a 6502 mpu on the card and running it at a higher clock rate than the standard Apple mpu. SpeeDemon can be installed in any slot except 0 and is said to be compatible with any other peripherals or software.

Since speed is the name of the game, we first tried SpeeDemon with the standard *Creative Computing* benchmark. On a standard Apple, the benchmark program takes 1:53 or 113 seconds; with SpeeDemon, it takes 35.5 seconds, 3.2 times as fast. The manufacturer of SpeeDemon claims an Apple will run up to 3 1/2 times faster with it; we think this claim is valid. For graphic evidence of the difference in speed, you need only run Brian's Theme, that marvelous, but agonizingly slow, graphics demo on the Apple System Master disk; you'll be enthralled by the difference.

The SpeeDemon automatically slows down for a disk access, after which it speeds up again. If you want it to slow down for I/O accesses in slots 4 and 5, a simple jumper on the board may be removed.

Naturally, there will be times when you wish to disengage the SpeeDemon—playing games or doing music synthesis, for example. To turn it off, you must press the ESC key within two seconds after turning on the Apple. You can also turn it off with a software POKE instruction. Once it has been turned off, only turning the computer off and then back on will re-activate the SpeeDemon card.

We found that the timing of pressing the ESC key was very critical; it must be after the computer is turned on but before the disk starts to spin, otherwise you are in speedup mode. In case you are wondering—no you can't play games with SpeeDemon; things move too fast, and the joystick (or paddle) is not polled for long enough to accept a response.

The SpeeDemon card has a built in self-test that can be engaged upon system start-up. It takes about two minutes to run and produces some rather boring mosaic patterns while it is doing so. Unfortunately, the instruction card gives no interpretation of the test message. Ours said, PASS 01, PASS 02, TEST PPPPF, and locked up. Does that mean it passed four tests and failed the fifth? It seemed to work okay, so we ignored these results.

Our recommendation: if you do much number crunching, sorting, data processing, or graphics work, SpeeDemon is probably an excellent investment (price $295), particularly if you frequently find yourself "waiting for the computer." On the other hand, if your applications are I/O bound (disk, printer, modem), or if you are running mostly games, educational packages, or music synthesis, SpeeDemon won't do you a great deal of good. ■

Firms Mentioned in this Column:

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Video-7 Inc.
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M-c-T
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Santa Monica, CA 90404
(213) 829-3641

DAVID AND SANDY SMALL

OUTPOST: ATARI

Last month we delved into mysteries of screen memory on the Atari. This month we continue that discussion and conclude with some specifics of assembly language.

Picking up where we left off, let's try a few more experiments. Type: SCREEN = PEEK (88) + 256*PEEK (89). If you then type PRINT SCREEN, you will get a number from 0 to 64,000 which tells you where "screen memory" begins. (My machine gives the value 40,000; if you have a 64K machine, you will probably get the same thing).

What is screen memory? It is just like regular memory, with an added plus; anything that is written there shows up on the TV screen as well. It is the section of memory that the Atari uses to store what goes to the screen.

On your Atari display, in graphics 0 (the default typing mode for you beginners) there are 24 lines of 40 characters. There are thus 24 x 40 or 960 characters on the screen. The Atari stores a number corresponding to what letter shows up on screen in what position in screen memory, sometimes called display memory. This is

What is screen memory? It is just like regular memory, with an added plus; anything that is written there shows up on the TV screen as well. The Atari uses it to store what goes to the screen.

because memory can hold only numbers, not letters; the designers get around this by assigning a numeric code for each letter.

For instance, clear the screen (with CTRL-CLEAR keys), and then type POKE SCREEN,33.

You will notice a difference on your TV screen: there will be a letter A in the upper lefthand corner. What happened?

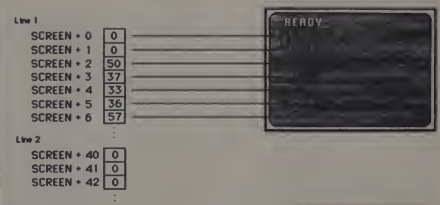

Figure 1.

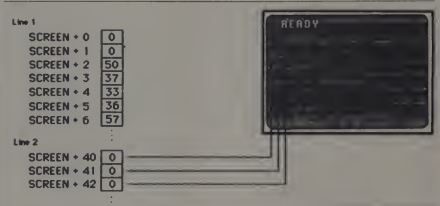

Figure 2.

Well, we wrote the code for an A character into the memory location that the Atari uses to store the upper-leftmost character on the screen. The Atari then faithfully displayed the A in the screen position corresponding to our memory location.

If we move up one character in memory, we will move one character to the right; for instance, POKE SCREEN+1,33 and you will get two A's displayed on screen.

If you PEEK (SCREEN+2), you will find what a "blank" or space looks like to the Atari: a 0. If you change this 0 to anything else, you will get a character on screen.

Everything the Atari outputs to the screen comes by way of this memory. In other words, when the Atari wants to send you the READY prompt when it first starts up, it writes a series of numbers into screen memory. You can duplicate the effect yourself:

```
POKE SCREEN+2,50
POKE SCREEN+3,37
```

```
POKE SCREEN+4,33
POKE SCREEN+5,36
POKE SCREEN+6,57
```

and READY will appear at the top of the screen, because you POKEd the right numbers for those characters. That is the exact same way the Atari gets the READY printed; it just stuffs numbers into memory. See Figures 1 and 2.

You have 64,000 memory locations to POKE into or PEEK from. Some have immediate effects and others are just temporary memory locations.

If you will imagine a post office for a moment, perhaps we can extend our analogy. There are 64,000 postal boxes there, and you are the postman. Looking at the wall from the inside, you see that some of the boxes are unused. Some just hold mail for a long time, and are rarely looked at. Some are very busy, and have mail going in and out all the time. And finally, there are special postal boxes which have an immediate effect, just as though the person the mail was addressed to was standing right in front of his postal box waiting for his mail. The instant that mail is put in the box, he takes it out and takes action on it.

That's a pretty good analogy of how the Atari works. You have 64,000 memory locations to POKE into or PEEK from. Some have immediate effects and others are just temporary memory locations.

We can have some fun with this knowledge. Let's run one memory location through every number it can hold and let the screen display what is in there at high speed:

```
 5 SCREEN=PEEK (88) +
256*PEEK(89)
10 FOR A=0 to 255
20 POKE SCREEN,A
30 NEXT A
40 GOTO 10
```

What you will see is a rapidly spinning character in the upper leftmost portion of the screen, which corresponds to the contents of memory for that location at any split second. It is whirling fast because the memory locations are changing fast.

What you are seeing is what the Atari does with a screen memory that is changing rapidly. The Atari makes the screen image reflect what is in memory 60 times per second. So 60 times per second it reads the number in the SCREEN location and sends a character that corresponds to that number to the TV.

Now let's change a whole chunk of memory at once. It will slow things down so you can see what is happening. This program takes a given number and puts it into several different screen locations, changing them all to the same thing. (For instance, if the number is a 65, then A's will appear all over the screen):

```
10 FOR A=0 to 255
20 FOR B=SCREEN to SCREEN
+100
30 POKE B,A
40 NEXT B
50 NEXT A
60 GOTO 10
```

You will see the first 100 locations of your screen (the first two lines of 40 characters each and the third line for 20 characters, totalling 100) all changing to the same letter. And remember, we are doing this by directly altering display memory without a single PRINT, POSITION, or PUT statement. Pretty neat, right?

Other mysterious things happen in memory. Try: PRINT PEEK(20). You will get a number (0-255). Type it again. Whoops! The number changed. Indeed, that number is constantly changing; it is counting from 0 to 255 every 1/60th of a second (so it completes one cycle about every four seconds).

Hey, this could be the foundation of a good clock. Just take the value found in location 20 and divide it by 60, that is the number of seconds gone by. And sure enough; there are several clock demonstration programs on the market that use this effect. The Atari keeps very good time.

Just turning the Atari on sets in motion a large number of processes, some interlocking, that are quite complex to follow.

To get a higher speed look at location 20. Try this:

```
10 PRINT PEEK (20)
20 GOTO 10
RUN
```

and stop the program after a few lines have written. You will see the counter counting up to 255, then going back to 0 and starting all over.

What this all boils down to is that unknown to you, the Atari is altering and using memory locations on its own. That little computer, which you thought was idle when you first started it up, is busily working away at memory and doing things even when you are not touching it. Just turning the Atari on sets in motion a large number of processes, some interlocking, that are quite complex to follow.

We could get a neat bird's eye view of this whole process by having the Atari use a different location for display memory, namely, the area around location 20. Right now, what you see on the screen reflects the contents of screen memory, up around 40,000. Let's change that so it reflects what is down at 20:

```
 10 DL=PEEK (560) +
256*PEEK (561)
 20 POKE DL+4,0: POKE
DL+5,0
```

All we have done is to tell the Atari to start displaying what is in memory starting at location 0. And my, what a strange display we get.

Remember, the Atari thinks it is displaying characters. What it is displaying, however, is the contents of low memory. So it interprets the numbers it finds down there as characters, and some of them are quite weird. What we are going to look for is motion, not a particular character; there are all sorts of strange numbers down in low memory, and they show up as strange characters. But if the characters move or change, we know that memory has changed.

About the middle of the first line will be location 20. It should be a whirling character, showing us that location 20 is indeed changing rapidly. On its left will be a character that changes every four seconds or so; it "ticks" every time location 20 goes over 255 back to 0.

Now, press a key and hold it down. All sorts of furious activity will occur. There will be a counter that starts up, telling the Atari how many 1/60ths of a second you have held the key down. The Atari "stack" will jump back and forth; you'll see this as a high speed flicker six lines down. And various other things in memory will change. (This is a really neat effect.)

For a really entertaining time, try running a short Basic program with the above lines as the first lines. Rather than seeing the output from Basic, you will see what the Atari is doing in some of its busiest memory locations, namely, Page Zero.

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The activity that goes on in even the simplest Basic program will amaze you. An example? Okay, just add 30 PRINT "HELLO": GOTO 30 to the above program. To get back to a normal screen, press SYSTEM RESET.

In summary, consider that everything going on in the Atari happens because you either read or write to a memory location. There are more than 64,000 of these locations, each containing a number from 0 to 255. Altering these contents produces spectacular effects.

Obviously, a map of all these memory locations, especially the ones with spectacular effects, is a pretty handy thing to have. There are several good ones on the market, and nearly every Atari book has such a map in an Appendix. Even the Atari Basic reference manual, written without mentioning many of the neatest features of the Atari, has a good little map in the back.

Next, before we quit for the day, I would like to tell you of a special language developed to help us talk to these 64,000 locations without so much hassle. We frequently see strange numbers to POKE into or PEEK from; wouldn't it be nice if the numbers made some sort of sense? For instance, if you are driving around town and need to find a house at 236 Dexter, you know to look between streets with addresses 200 and 300 on Dexter; those numbers "make sense." But the Atari numbers don't really seem to make any sense: 0 to 255, 64,000 memory locations, PEEKing to 53246.

However, if you can learn to speak a special language—almost a code—they will make more sense, and much of the mystery of this machine will disappear. It is a bit like touring a foreign country whose language you do not speak; much of the culture and history is inaccessible to you. But if you take the time to learn the language, much of what the country is about becomes clear to you; you understand why things are as they are.

Fortunately, in the case of the Atari, we are not talking about something as difficult as a foreign language; we are talking about hexadecimal (hex) notation, a special code for identifying the 64,000 memory locations. In hex, everything comes out evenly. It is convenient to use, and provides a really clear understanding of the machine. Many of the subtleties of the Atari will become clear just because you are working in hex.

True, it takes a little work to learn hex and to speak it comfortably. But if you do, you will know it for any computer, because everyone else uses hex, too. And you will be on far more intimate terms with more advanced computer articles, and on your way to understanding even some complex hardware principles. Finally, if you learn hex and really understand it, you will find that assembly language—that dreaded mystery for beginners—is positively easy. (The only hard part of assembler is learning memory concepts.)

Why bother with assembler? For speed. Assembler gives you absolute control over the computer and lets you accomplish things as fast as possible. As a sneak preview of what we will be getting into, remember our Basic program of a few paragraphs back, which flipped 100 letters on the screen over and over? Well, try the program in Listing 1, which does the same thing with assembly language, and compare the speed.

See you next time for an introduction to hex. I enjoy playing around with the Atari and hope you do too; it is far and away the most powerful graphics computer you can buy for anywhere near the price.

Incidentally, for our assembler course, you will need an Assembler cartridge or another assembler (MAC/65 or AMAC are fine) eventually. But there is no rush; we will stick with Basic for a while and use assembler only for a few bits and pieces. ■

Listing 1.

```
10 FOR A=0 to 100

20 READ Z

25 IF Z=256 THEN 100

30 POKE 1536+A, Z

40 NEXT A

100 X=USR(1536)

110 DATA 165,88,133,205

120 DATA 165,89,133,206

130 DATA 160,0

140 DATA 145,205,200

150 DATA 192,100,208,249

160 DATA 24,105,1,76,8,6

170 DATA 256
```

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Commodore 64 Benchmark
(Sieve of Eratosthenes)

	PROMAL	BASIC	COMAL	FORTH	PASCAL	
Execution Time (secs.)	30	630	490	51	55	
Object Code Size (bytes)	128	255	329	181	415	
Program Load Time (secs.)	3.2	3.8	6.3	11.2	23.5	
Compile Time (secs.)	8.5	—	—	39	108	

As the benchmark results in the table show, PROMAL is much faster than any language tested. From 70% to 2000% faster! And it generates the most compact object code. The PROMAL compiler is so fast that it can compile a 100-line source program in 10 seconds or less. And, not only is it fast in compile and run time, it also reduces programming development time.

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COMMODORE'S PORT

Preview of the Plus 4, the Amiga, and Alphacom printers

The Plus 4 is compact and rather neat looking, and its directional cursor keys are fun.

Howdy do once again, Commodorians. Things are sure hopping around the old Port lately. I hardly know where to begin. As the holiday season descends upon us, it is probably fair to say that this Christmas belongs to Commodore. The 64 is still selling well, and C-64 consumer titles are moving better than any others in the industry right now. Prices are at an all time low, and quality at an all time high. And that's not all.

Plus 4 Preview

A mysterious box showed up at the lab the other day, and it contained a mysterious machine—the Commodore Plus 4 computer. Commodore had been talking about shipping that machine in some form or another since the very early part of this year. Regular readers of this column will know that I have been rather critical of the Plus 4 and of its earlier incarnations, the models 264 and 364, in previous issues. Its lack of compatibility with the 64 and lack of sprite graphics and multivoice sound, have mystified me to say the least.

So I disliked it, right? Wrong, byte breath. Much to my own surprise, the Plus 4 is a much nicer machine than I had imagined. It comes with a word processor, spreadsheet, file manager, Basic, and a machine language monitor in ROM. It has windowing capability, a Help key, and eight pre-programmed but reprogrammable function keys, and it is compatible with most existing Commodore peripherals.

Though it does not have sprite graphics, it sports five graphics modes, including a bit-mapped hi-res mode with a resolution of 320 x 200 pixels. It can generate 121 colors and handle split text and hi-res graphics screens, and its two-tone sound generator is serviceable (a third channel handles white noise).

The Plus 4 is compact and rather neat looking, and its directional cursor keys are fun. It makes available a whopping 60K from Basic—amazing for a 64K machine—and that Basic is very powerful.

How powerful, you ask? Good question. Plus 4 Basic is the best implementation ever to be offered as standard on a Commodore computer. It offers more than 75 commands. Some of the more interesting commands are listed below:

- AUTO—automatic line numbering feature.
- BACKUP—copies all the files from one disk to another on a dual drive system. Formatting also takes place automatically when this command is invoked.
- COLLECT—frees up space allocated to improperly closed files and de-

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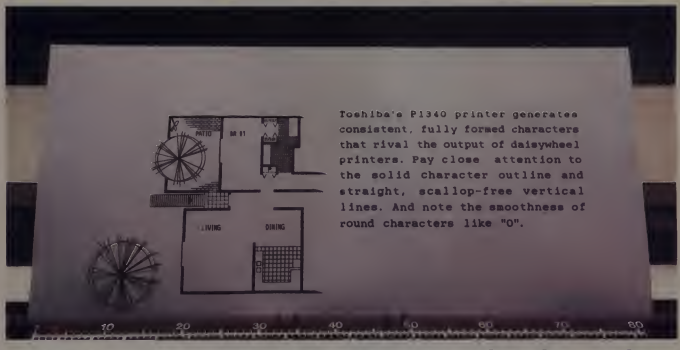

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• DELETE—deletes specified blocks of Basic text.

• DIRECTORY—allows a disk directory to be called up from Basic without disturbing the program in current memory.

• DLOAD—loads a file from disk. This replaces the parameter 8 that must be typed to load disk files on earlier Commodore machines. However the line LOAD "PROGRAM NAME", 8 will still load a file from disk in the usual manner.

• DSAVE—does the same for the SAVE function.

• HEADER—formats a disk. Replaces cryptic multiple commands necessary to format a disk on earlier Commodore machines.

• HELP—flashes the characters in a listing line that triggered an error during a program run.

• KEY—allows definition of macro strings to be associated with the eight available function keys (four unshifted and four shifted). Similar to the KEY command in Simon's Basic.

• RENUMBER—renumbers Basic lines according to specified parameters. Updates internal line number references as well.

• SCRATCH—deletes a file from disk.

Plus 4 Basic also includes hi-res graphics, sound, and structured programming commands similar to those found in Simon's Basic. These make programming in Basic much more pleasant than it has ever been on the Pet, Vic, or standard 64. Graphics commands like BOX, CHAR, CIRCLE, COLOR, DRAW, and PAINT simplify graphics applications enormously.

Other high level programming commands are the following:

• DEF FN—allows a complex calculation to be defined as a function. Then you can call the function, inserting new values to be calculated at each call.

DO/LOOP/WHILE/UNTIL/EXIT—These commands work individually or in concert to simplify program logic.

• PUDEF—lets you redefine up to four symbols in a PRINT USING statement. You can change blanks, commas, decimal points, and dollar signs into other characters by placing the new character in a PUDEF control string.

• TRAP/RESUME—error interceptor and means of returning to program execution after an error has been trapped.

• TRON/TROFF—trace mode for program debugging.

As you can see, this Basic implementation is chock full of more goodies than any Commodore programmer has ever had. That is what, to my mind, makes it even more unfortunate that the Plus Four is so incompatible. It is a promising machine with some real problems. The Plus 4 will meet resistance in the marketplace from consumers and from software developers—especially as it is slated to cost $100 more than the 64, which has finally accumulated an excellent software library. Why, even the Plus 4 joystick, cassette, and ROM cartridge ports are incompatible with the current line. Why, why, why?

Then there is the question of the built-in software. In brief, from my perusal of the offerings, I would guess that the applications were whipped up in a great hurry. I would hate to pay for ROM applications I was never going to use. And believe me, I would never use the software built into the Plus 4 we received.

So, Commodore, what to do? I will tell you, okay? Take the C64, slap another 64K of bank-switched memory into it and squeeze it into a sexy case. Improve the keyboard by arranging it into a Selectric-style layout and bettering its feel. Take the excellent Basic from the Plus 4 and build it into the new "C128," adding special sprite and SID commands as in Simon's Basic. Keep the directional cursor keys and function keys across the top, as well as the built-in machine language monitor. Return to the port configurations of the past. Make sure all the machine language disks and ROM cartridges designed for the 64 run beautifully on the C128. And price it at $400 list.

And oh yeah, one more thing. Have the design experts work whatever overtime it takes to give the C128 an extremely low return rate. Design it to work. That will give it an image that the C64, for all its features, has as yet failed to attain: one of true quality.

The Commodore Amiga

If you are the broadminded type of Commodorian who takes time out to read "Outpost: Atari" in this magazine (as I hope you do), you may already be familiar with the Amiga prototype codenamed Lorraine. I suggested in the October "Outpost" that Atari should put 100% of its effort behind development of the Amiga machine.

In what can only be described as a surprising development, the Amiga project was acquired by Commodore—only days after that "Outpost" went to press. Atari's loss is Commodore's gain, as the Amiga Lorraine is the most impressive consumer graphics and sound machine I have ever seen.

In a nutshell, the Lorraine is the following: a 68000 processor running at 8 MHz—backed up by three custom VLSI chips to handle graphics, sound, and I/O. It comes with 128K expandable to at least 1 meg. A 5.25" internal floppy capable of storing 320K is also standard.

Figure 1. ASCII/graphics and upper/lowercase characters.

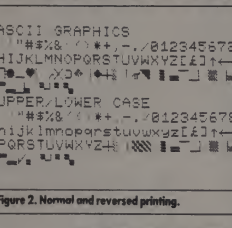


Figure 2. Normal and reversed printing.

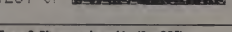
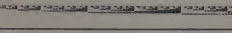


Figure 3. Bit mapped graphics (0 to 255).



Listing 1.

```
600 OPEN 4,4,11
610 FOR I=0 TO 255
620 PRINT#4,CHR$(I);
625 FOR J=1 TO 39:PRINT#4,CHR$(0); NEXT
630 NEXT I
640 CLOSE 4:CMD 0
```

Firms Mentioned in this Column

Commodore Business Machines
1200 Wilson Dr.
West Chester, PA 19380
(215) 431-1900

Alphacom, Inc.
2323 S. Bascom Ave.
Campbell, CA 95008
(408) 559-8000

Using bit-plane animation, the Lorraine creates fluid real-time animation in multicolor hi-res. It sports four channels of stereo sound with speech capability.

It would seem that Commodore does realize the importance of the Lorraine, and one can only hope that they will nurture the development team to the realization of a true next-generation consumer machine. The same statement I made about the still-imaginary C128 applies doubly here: Commodore must assert a true commitment to total quality in the final design and assembly of the Amiga. To do otherwise would be utter execration, not to mention desecration.

Vic 20—End of an Era?

With the introduction of the Commodore 16, a downwardly compatible machine with 16K for $99, Commodore has ended production of the Vic 20, the first computer to sell more than one million units. Vic software is now selling at record low prices, and *Electronic News* reports that this liquidation mentality has led to brisk sales.

Though I will bid a fond farewell to the Vic, I do feel reports of its death are greatly exaggerated. Sure, many of them are in closets—mine currently is, so I'll be the first to admit it. But I am quite sure that the majority of Vics are still hooked up and being used regularly. The Vic can still do plenty, and Vic users should rest assured that *Creative Computing* has not forgotten them. More applications are on the way, folks.

Alphacom Printers

Although we reviewed the Alphacom 42 many moons ago in Print About Printers, it is still on the market, and still represents an excellent buy. The Alphacom thermal printers come in both 40- and 80-column versions. We finally got a C64 interface for our Alphacom 42 (the 40-column version) so we will talk about it; most of our comments apply to the 80-column version as well.

The printer is a lightweight, compact thermal unit that uses continuous roll paper. Both black and blue paper are available. There are only two controls on the printer, off/on and paper advance. There is no indication whether the printer is off or on. The printer has a self-test mode that prints out complete character sets.

The machine has a small external power supply. An interface card in a plastic housing plugs into the base of the printer; it has a cord that plugs into the serial port on the back of the C64 or disk drive.

The printer is activated from Basic with a command of the format, OPEN fn, dn, sa (e.g., OPEN 1,4,8) in which "fn" is the file number, "dn" is the device number, and "sa" is the secondary address. This last address is actually a code that instructs the printer to print data as received, print with condensed height, use the ASCII character set, use upper and lowercase, or use the "bit map" mode. Print commands are sent to the printer with a PRINT #fn statement.

As mentioned, the printer can print C64 graphics characters and lowercase (see Figure 1). It can also print reverse printing (light on dark), but quality suffers (see Figure 2). Bit mapped graphics are interesting, but will take many hours to master. We wrote a short program to print the bit configurations from 0 to 255 (see Figure 3 and Listing 1).

The printer is whisper quiet in operation and produces acceptable copy. With interface, the 40-column unit generally sells for about $150, a real bargain.—*DHA*

Next month, we'll have a second look at graphics systems for the C64, a MiniDOS update for the Vic 20, and a tutorial on sound from Simon's Basic. See you then. ■

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SUSAN GLINERT-COLE

IBM IMAGES

Better Basic—It really is

Every once in a great while a product comes along that is so amazing that superlatives fail miserably (and also sound pretty corny) when trying to frame a capsule description. Let me just string a few in here for the record: BetterBasic, from Summit Software, is *WONDERFUL*, !MARVELOUS!, ^^^FANTASIC^^^. I am sorry that they chose to use the word Basic in the handle, because Basic haters may be reluctant to try it out. They will be missing a good, nay, great, thing if their (not unreasonable) prejudices cause them to pass BetterBasic by.

BetterBasic combines all the best features of interpreted Basic, Pascal, and Forth, with a few lagniappes from C and assembly language thrown in for good measure. While it appears to the user as an interpreted language, in fact it is incrementally compiled. As statements are entered, they are converted to an intermediate pseudo-code, which is then interpreted by the run-time interpreter. Before you gag on the concept of p-code, I suggest you refer to the benchmark table (Table I). BetterBasic was only a second slower than compiled Microsoft Basic.

BetterBasic requires an IBM PC, PC/XT, or a "100% compatible" computer. It can run in 128K, but 192K is recommended. It needs only single sided drive and will operate under PC-DOS 1.1 and up. It was designed to be compatible with Microsoft Basic, although there are some differences that might necessitate a bit of editing. Program conversion is thoroughly covered in an appendix. Some of the dissimilarities will gladden your heart, for example:

- BetterBasic does not need to do garbage collection, so FRE is replaced by SIZE, which gets the amount of free memory.
- Random record manipulation is simplified considerably in BetterBasic. Thus MKI$ and friends, FIELD, GET, and PUT are all replaced by READ RECORD and WRITE RECORD.
- DEF FN is not needed; there are much more powerful function facilities available.

On the down side, the joystick and light pen are not supported; neither are active or visual pages.

Procedures

Procedures and functions are supported in the manner of Pascal and C, with local variables and parameter passing by value or address. The language is extensible; functions and procedures defined by the user can be incorporated into BetterBasic and used just like the built-in commands a la Forth. Programs, and/or procedures and/or functions can be converted to self-contained, separately compiled packages called *modules*. Modules can contain entire application programs. Both programs and modules can be converted to executable .COM files.

The module is central to BetterBasic, and the kernel system comes fleshed out with several standard ones (graphics, sound, and event trapping among others). Additional modules are offered at extra cost. These include support for windows, 8087 support, an advanced programming package (direct support for assembly language), and a run-time module for making commercial application packages.

Programs, and/or procedures and/or functions can be converted to self-contained, separately compiled packages called *modules*.

Purchasers of the latter module will be licensed to sell applications without any additional royalties. They are working on a module that will permit interrupt calls along the same lines as Borland's Turbo Pascal method.

BetterBasic supports the full complement of memory for the PC (640K). The main program can be only 64K in size, but each procedure and function can also occupy 64K, making the program size limited only by memory. The data space for the main program can be another 64K, and each module can have 64K of data space all to itself. A 64K stack can also be allocated.

The documentation is handsomely presented in a fat, half-height binder and contains a table of contents and an index. The sections are separated with sturdy, plastic-coated tabs—a thoughtful touch that IBM manuals unfortunately lack. Besides being nice to look at, the manual is well organized, informative and complete. The first section is a tutorial, and while it touches on only a few of the more

Table 1. Sieve of Eratosthenes

Basic	Time (in seconds)
PC-Basic (interpreted)	13
PC-Basic (compiled)	4 (single precision)
Professional Basic	8
MegaBasic (interpreted)	20
MegaBasic (runtime)	19
MegaBasic (runtime, crunched)	18.5
BetterBasic	5

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Speed: Sieve of Eratosthenes Benchmark:
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  - –Pointer (of any type).

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exotic bells and whistles of BetterBasic, it does a good job of acclimating the new user.

Full Screen Editor

The full screen editor is a pleasure to use, especially after struggling with the minimal line editor of MegaBasic. There is full, dynamic syntax checking (with meaningful error messages) when a line of code is entered. There is also a CHECK command that checks the logical structure of a program and optionally ascertains if sufficient memory exists for arrays, records, and other memory-hungry structures. There is an automatic listing formatter built into the editor. Listings 2 and 4 show complete printouts, including procedure and function definitions, with keywords capitalized and block structures neatly indented by the formatter. I would prefer several blank lines between the main program and the rest of the stuff, but that is getting a bit picky.

There is a cross-reference command that will generate a symbol cross-reference listing for the current workspace (e.g. main program, function, or procedure). It can also take an optional single identifier and list only references pertaining to it. The listing can be saved to a file or device if desired.

An extensive variety of data types is supported: byte, integer, real, string (32,767 characters), pointer (of any type), record, array, and array of arrays. Alas, there is no double length integer type, something I missed when running the Sieve. Real numbers are Binary Coded Decimal, which I guess is becoming fashionable in these days of financial crisis. You can choose your own precision; any number between 6 and 24 digits is acceptable.

There is a rich set of commands, statements, procedures, and functions incorporated into BetterBasic.

Pointer variables are declared as any other data types e.g.:

```
BYTE PTR: namelist
STRING PTR: namelist
```

and so on.

The procedure:

```
SET pointer = variable
```

initializes a pointer variable to point to an actual variable. Pointers can be directed at a variable subrange such as a substring, an array element, or a record field.

The declaration STRUCTURE is similar to the RECORD declaration in Pascal, and pointers can be aimed at structures as well. To make things really interesting, you can use another set of declarations to associate a name with the structure of an array rather than the structure itself. Thus the structure name can be used to declare actual arrays, array pointers, array fields in records, or arrays of arrays.

Commands

There is a rich set of commands, statements, procedures, and functions incorporated into BetterBasic. First of all, conditional execution of code blocks can be directed with any of the following statements:

```
DO (unconditionally)
DO IF
DO x TIMES
DO UNTIL
WHILE . . DO
FOR . . NEXT
END DO
REPEAT
REPEAT IF
EXIT
EXIT x LEVELS
```

GOTO and GOSUB are implemented, but unnecessary in light of the above list.

Character manipulation has a few extras as well.

```
READCHAR (#token) AS (,x)
```

will read characters from a file, device, or string into A$, where #token denotes an optional integer previously associated with an input device or a file, and x is the

Firms Mentioned in this Column

Summit Software Technology
40 Grove St.
Wellesley, MA 02181
(617) 235-0729

Framework
Ashton-Tate
10150 West Jefferson Blvd.
Culver City, CA 90230
(800) 437-4329
In Colorado: (303) 799-4900

Listing 1. Walking lines PC Basic.

```
10 ' walking lines program - from BYTE magazine
20 ' converted to IBM by Grant Irani - Fallston, MD
30 ' additional conversion by Hill Pastie
40 ' last edit:  22 Dec 81 (mildly edited by SG-C 8/29/84)
50 DEFINT A-Z
70 RANDOMIZE VAL(RIGHT$(TIME$,2))
80 CLS
90 BACKTINT=0:PALETTE=0
100 KEY (1) ON: ON KEY (1) GOSUB 380
110 KEY (2) ON: ON KEY (2) GOSUB 410
120 SCREEN 1,0
130 KEY (10) ON: ON KEY (10) GOSUB 440
140 COLOR BACKTINT,PALETTE
150 DIM LINES(150,4)
160 DEF FNRAND(LIMIT)=INT(RND(1)*LIMIT)+1
170 X1=FNRAND(320)-1:Y1=FNRAND(200)-1:DX1=FNRAND(11)-6:DY1=FNRAND(11)-6
180 X2=FNRAND(320)-1:Y2=FNRAND(200)-1:DX2=FNRAND(11)-6:DY2=FNRAND(11)-6
190 TINT=1
200 LX=0 'index into lines
210 CNT=0 ' number of lines
220 CHKCNT=FNRAND(250)
230 LINE (X1,Y1)-(X2,Y2),TINT
240 LX=(LX+1)MOD 150
250 IF CNT<150 THEN LINE (LINES(LX,0),LINES(LX,1))-(LINES(LX,2),LINES(LX,3)),
BACKGRND
260 LINES(LX,0)=X1:LINES(LX,1)=Y1:LINES(LX,2)=X2:LINES(LX,3)=Y2
270 IF CNT<150 THEN CNT=CNT+1
280 CHKCNT=CHKCNT-1
290 X1=X1+DX1:IF X1<0 OR X1>319 THEN DX1=-DX1:X1=X1+DX1
300 Y1=Y1+DY1:IF Y1<0 OR Y1>199 THEN DY1=-DY1:Y1=Y1+DY1
310 X2=X2+DX2:IF X2<0 OR X2>319 THEN DX2=-DX2:X2=X2+DX2
320 Y2=Y2+DY2:IF Y2<0 OR Y2>199 THEN DY2=-DY2:Y2=Y2+DY2
330 IF CHKCNT>0 GOTO 230
340 ' X1=FNRAND(320)-1:Y1=FNRAND(200)-1:X2=FNRAND(320)-1:Y2=FNRAND(200)-1
350 DX1=FNRAND(11)-6:DY1=FNRAND(11)-6:DX2=FNRAND(11)-6:DY2=FNRAND(11)-6
360 TINT=(TINT+1)MOD 3)+1
370 GOTO 220
380 BACKTINT=(BACKTINT+1)MOD 16
390 COLOR BACKTINT,PALETTE
400 RETURN
410 PALETTE=PALETTE+1
420 COLOR BACKTINT,PALETTE
430 RETURN
440 END
```

(optional) number of characters to read. Similarly,

```
READCHR FROM A$, B$, x
```

reads x characters from A$ and puts them in B$.

Saving and restoring screens in BetterBasic is simple. The statements:

```
SAVE SCREEN minrow,
  mincol, maxrow,
  maxcol,Bytearray
RESTORE SCREEN minrow,
  mincol, maxrow,
  maxcol,Bytearray
```

are self-explanatory. They are useful when used in conjunction with a series of window manipulation procedures. A window is defined as follows:

```
DEFINE WINDOW #, minrow,
  mincol, maxrow, maxcol,
  (color), (, ON
  background) (BLINK)
```

where # is the window number. Foreground and background colors, as well as blink can be optionally set. A title can be displayed (in any color) at the top of a window with HEADER. Frames can be drawn anywhere on the screen with the procedure:

```
FRAME color, minrow,
  mincol, maxrow, maxcol
```

and the procedure FRAME WINDOW x,(color) draws a frame around window x. All window parameters can be saved into an array and later recalled with SAVE PAR/RESTORE PAR procedures.

PEEK and POKE are augmented with several functions/selectors. The function:

```
A = WOR [seg:offset]
```

returns the word at the specified memory location.

```
WOR [seg:offset] = A
```

stores the value of A in memory.

```
PRINT WOR [seg:offset]
```

prints the value of the word at the specified location. BYT is the 8-bit counterpart of WOR. There are also logical and arithmetic shift, and rotate functions.

The interface to assembly language at this writing is slightly complicated, but well explained in an appendix. There are several examples given as well, which is very helpful. The IBM PC-DOS DEBUG.COM can be invoked from within BetterBasic to trace through an assembly language procedure.

Listings 1 through 4 will give you some idea what a Basic program *can* look like. I emphasize "can," because if your preference runs to listings like 1 and 3, you can write them that way instead of taking advantage of BetterBasic. Listings 1 and 2 are the IBM Basic and

Listing 2. Walking lines BetterBasic version.

```
SOURCE
PRECISION 8
PROCS=11
INTEGER: Background,Palette,Tint,IX,Count,Changecount,X1,X2
INTEGER: Y1,Y2,DX1,DX2,DY1,DY2
INTEGER ARRAY(150,4): LineArray
PROCEDURE: Setup
   EXTERNAL: Background
   EXTERNAL: Palette
   EXTERNAL: Tint
   EXTERNAL: IX
   EXTERNAL: Count
   EXTERNAL: SetUpPoints
   EXTERNAL: Resolution
   EXTERNAL: ChangeBackground
   EXTERNAL: ChangePalette
      10 RANDOMIZE TIMER:CLS
      20 Background = 0: Palette = 0: Tint = 1
      30 COLOR Background, Palette
      40 IX = 0: Count = 0
      50 KEY (1) ON: ON KEY (1) ChangeBackground
      60 KEY (2) ON: ON KEY (2) ChangePalette
      70 Resolution MEDIUM
      80 SetUpPoints
END PROCEDURE

INTEGER FUNCTION: Random
      10 REBULT =  (RND(1) * Limit) + 1
END FUNCTION

PROCEDURE: Increment
      10 X = X + 1
END PROCEDURE

PROCEDURE: Decrement
      10 X = X - 1
END PROCEDURE

PROCEDURE: SetUpPoints
   EXTERNAL: X1
   EXTERNAL: X2
   EXTERNAL: Y1
   EXTERNAL: Y2
   EXTERNAL: DX1
   EXTERNAL: DX2
   EXTERNAL: DY1
   EXTERNAL: DY2
   EXTERNAL: Random
      10 X1 = Random (320) - 1 : Y1 = Random (200) - 1
      20 X2 = Random (320) - 1 : Y2 = Random (200) - 1
      30 DX1 = Random (11) - 6 : DY1 = Random (11) - 6
      40 DX2 = Random (11) - 6 : DY2 = Random (11) - 6
END PROCEDURE

PROCEDURE: ChangeTint
      10 Tint = ((Tint + 1) MOD 3) + 1
END PROCEDURE

PROCEDURE: Resolution
      10 IF Type = 1 OR 3 THEN WIDTH 80
      20 SCREEN Type - 1
END PROCEDURE

INTERRUPT PROCEDURE: ChangeBackground
   EXTERNAL: Background
   EXTERNAL: Palette
      10 Background = (Background + 1) MOD 16
      20 COLOR Background, Palette
END PROCEDURE

INTERRUPT PROCEDURE: ChangePalette
   EXTERNAL: Palette
   EXTERNAL: Background
      10 Palette = Palette + 1
      20 COLOR Background, Palette
END PROCEDURE

PROCEDURE: EraseLine
   EXTERNAL: LineArray
   EXTERNAL: IX
   EXTERNAL: Background
   INTEGER: X1,X2,Y1,Y2
      10 X1 = LineArray (IX,0)
      20 Y1 = LineArray (IX,1)
      30 X2 = LineArray (IX,2)
      40 Y2 = LineArray (IX,3)
      50 LINE (X1,Y1)-(X2,Y2), Background
END PROCEDURE
```

(continued)

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It feels quite odd to look at the map and see nothing. Of course you have to explore the more than 2800 screen new world in order to map it. But the way the natives act, the way you get older, the way seasons change and your men behave, and the way your reputation proceeds you gives you a sort of feeling that's unexpected in computer games. It's deeper. Maybe a little disquieting. It plays as much in your head as it does inside your computer.

Seven Cities does all this with the real world or, better still (since the "new" world really isn't anymore), it will construct any number of completely detailed hemispheres for you to try your hand with.

Designed by Ozark Softscape (the people who made M.U.L.E., *Infoworld's* "Strategy Game of 1983"), *Seven Cities* is about as near a recreation of history as has ever been accomplished, with or without a computer.

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This is Europe in scrolling 3-D graphics. You outfit, visit the Crown, launch your ships, and if you're not out for this, you return later to tell all sorts of wild stories about what it's like over there.

There are over 2800 screens to explore in the new world. As you scroll through them, seasons change.

Animated natives surround you. They have no reason to trust you. The drum beat quickens.

Trading with the Aztecs is tricky. You could wind up with enough gold to build an empire. Or as soup.

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Listing 2. Walking lines BetterBasic version. *(continued)*

```
PROCEDURE: NextPoint
   EXTERNAL: X1,X2,Y1,Y2,DX1,DX2,DY1,DY2
   EXTERNAL: Random
      10 X1 = Random (320-1) : Y1 = Random (200) - 1
      20 X2 = Random (11)-6 : Y2 = Random (11) - 6
      30 DX1 = Random (11)-6 : DY1 = Random (11) - 6
      40 DX2 = Random (11)-6 : DY2 = Random (11) - 6
END PROCEDURE
   10 Setup
   20 DO
   30   Changecount = Random (250)
   40   DO UNTIL Changecount = 0
   50     LINE (X1,Y1) - (X2,Y2), Tint
   60       IX = (IX + 1) MOD 150
   70       IF Count = 150 THEN EraseLine
   80     LineArray (IX,0) = X1 : LineArray (IX,1) = Y1
   90     LineArray (IX,2) = X2 : LineArray (IX,3) = Y2
  100     IF Count     150 THEN Increment Count
  110     Decrement Changecount
  120     X1 = X1+DX1 : IF X1 < 0 OR X1 > 319 THEN DX1 = -DX1 : X1 = X1 + DX1
  130     Y1 = Y1+DY1 : IF Y1 < 0 OR Y1 > 199 THEN DY1 = -DY1 : Y1 = Y1 + DY1
  140     X2 = X2+DX2 : IF X2 < 0 OR X2 > 319 THEN DX2 = -DX2 : X2 = X2 + DX2
  150     Y2 = Y2+DY2 : IF Y2 < 0 OR Y2 > 199 THEN DY2 = -DY2 : Y2 = Y2 + DY2
  160   REPEAT
  170   NextPoint
  180   ChangeTint Tint
  190 REPEAT

ENDFILE
```

BetterBasic versions respectively of an entertaining little graphics show. Listings 3 and 4 are the Sieve again. Table I shows the cumulative benchmarks of Basics I have tested so far.

Summary

BetterBasic is as robust as they come; in the four months I have been using it, it has never crashed or done anything odd. End user support is outstanding. The folks at Summit Software fall all over themselves in an effort to solve your problems (I might add that the only problems I had were of my own doing).

I do have a few complaints, all of them relatively trivial. The compiler is very greedy when it comes to disgorging variables, procedures, and functions that are no longer wanted. If you make a mistake entering them, they are there forever and cannot be thrown out. This includes the minor, but irritating, fact that they cannot be renamed if declared external. So if, like me, you accidentally had the Caps Lock key on and typed the function name as fARKLES instead of the comlier Farkles, you are stuck with it.

BetterBasic is as robust as they come; in the four months I have been using it, it has never crashed or done anything odd.

Along the same lines, arguments must be declared before any code is placed into that subroutine. If you de-

Listing 3. PC Basic Sieve program.

```
10  '                    Sieve of Eratosthenes
15  '                       PC-BASIC
20  '
30    TIME$ = "0:0:0"
40    DEFINT A-Z: MAXINT = 1000:PRIME = 2
50    DIM X (MAXINT)
60    FOR I = 1 TO MAXINT STEP 2
70      X(I) = 1
80    NEXT I
90  '
100     PRINT PRIME;
110 '
120   IF PRIME * PRIME > MAXINT THEN 180
130     FOR I = PRIME * PRIME TO MAXINT STEP PRIME + PRIME
140       X(I) = 0
150     NEXT  I
160 '
170   FOR J = PRIME + 1 TO MAXINT
180     IF X(J) > 0 THEN PRIME = J:GOTO 110
190   NEXT J
200   PRINT: PRINT "elapsed time = "; TIME$
210   END
```


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cide to pass two parameters instead of one at some later time, you can't declare it. The only recourse is to set up another procedure, with, alas, another name if the original version is declared external. While this discourages the practice of al fresco coding, it is hard lines on several of us who, from time to time, have been known to make mistakes.

Brief Notes

Framework, from Aston-Tate, is an exquisitely designed product. It embodies the entire gamut of fashionable hyphenated buzz words: user-friendly, context-sensitive on-line help, windowing, pop-up (or is it pull-down?) menus, integrated, idea processing, integrated spreadsheet / word processor/data base management personal productivity tool. Sorry guys, no mouse. I have been using it for a week and, despite it's *terrible* copy protection scheme, the clusters formerly occupied by my spreadsheet have been heartlessly deallocated, and I now use my word processor only for fancy formatting. More details next month. ■

Listing 4. BetterBasic Sieve program.

```
SOURCE
PRECISION 0
OPTION BASE 1
PROCS=1
INTEGER: 1
INTEGER ARRAY(1000): X
REAL: Prime

PROCEDURE: Strikeout
   REAL ARG: Prime
END PROCEDURE

PROCEDURE: Strikeout
   INTEGER: J
   EXTERNAL: X
      10 PRINT Prime;
      20 DO IF Prime * Prime <= 1000
      30    FOR J = Prime * Prime TO 1000 STEP Prime + Prime
      40       X(J) = 0
      50    NEXT
      60 END DO
END PROCEDURE
  10 TIME$ = "0:0:0" : Prime = 2
  20 FOR I = 1 TO 1000 STEP 2
  30   X(I) = I : X(I+1) = 0
  40 NEXT
  50 Strikeout Prime
  60 FOR I = Prime + 1 TO 1000
  70   IF X(I) > 0 THEN Prime = I : Strikeout Prime
  80 NEXT
  90 PRINT : PRINT "Elapsed time = "; TIME$

ENDFILE
```


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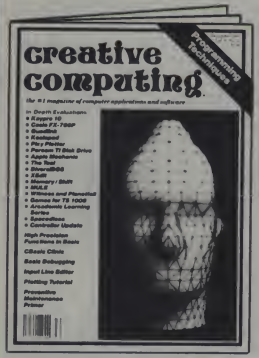

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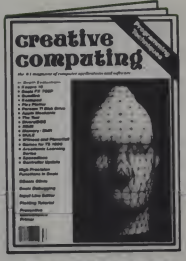

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Texas Instruments	H	S
Timex Sinclair	I	T
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None	K	V

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IBM	F	O
Radio Shack/Tandy TRS-80	G	R
Texas Instruments	H	S
Timex Sinclair	I	T
Other (specify)	J	U
None	K	V

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JAKE COMMANDER

TANDY GRAM

Beginning this month, our Tandy column sports a new look, a new title, and a new columnist. Steve Gray, who has written the column since its inception, will continue to write for Creative Computing. But after 67 straight columns, he is taking a rest. Starting off here is Jake Commander: programmer, writer, and ex-staff member of Color Computer magazine. His expertise with the TRS-80 series is renowned.—JJA

Creative Computing is ten years old—a venerable old age for a microcomputer magazine. No other magazine in this business has been around that long. *Creative* is the rock of ages of the computer mags. The TRS-80 wasn't even a twinkle in Radio Shack's eye when David Ahl started this thing—a thought that should humble all of us TRS-80 pioneers. This isn't a magazine; it's an institution. As a result, I feel as if I have accepted a position at some long-established hall of learning. So many writers have gone before me; I think to myself in respectful tones, "Who? Me?"

In all seriousness, it is with pleasure and delight that I have accepted the invitation to write a TRS-80 column for this magazine. And bearing in mind that awfully long tradition, I hope I can impart some entertaining, informative, and useful information on the way.

This is a welcome opportunity to share some of the TRS-80 secrets I have managed to unravel during many, many hours of work. For the last seven years, I have been using a TRS-80 in one form or another and can honestly say I have never regretted my original decision to buy one. The product line seems destined to be as long-lived as this magazine.

A Bit of History

In days past, however, things were much simpler. When I think back a mere five years ago, I remember that the term TRS-80 meant one thing—the Model I. I could concentrate on writing software for it with the knowledge that my potential audience consisted of a majority of people with Level II Basic installed in their machines. The minority that insisted on using Level I Basic, well, surely they couldn't be serious, and they represented less than 10% anyway. In those days, if you were a Level II expert, you had your TRS-80 doctorate.

In the meantime however, Radio Shack was having other ideas. First the Model II appeared. Apart from sharing the same Z80 microprocessor as its smaller sibling, the Model II was radically different from the Model I. For a start, the price was nearly eight times higher, raising the ante to the point where you actually had to save some money if you wanted to buy one.

Radio Shack had also foreseen the business potential of micros and had started courting that fraternity. As far as non-business use went, the Model II didn't change anything. The hackers, beepers, hobbyists, and computer prodigies were still content to poke around inside the Model I, elevating it to heights that must have surprised even Radio Shack.

Then, along came the Color Computer. Apparently, Steve Leininger, the Radio Shack design whiz, had been hard at it again following the success of his Model I design. At first glance, the Color Computer appeared an innocuous little machine that suffered from an incurable 32 characters per line and no lower case. But the harder you looked, the more you could see.

At first glance, the Color Computer appeared an innocuous little machine that suffered from an incurable 32 characters per line and no lower case. But the harder you looked, the more you could see.

Like a fool, I bought one, opened the case (warranty? what warranty?) and peered inside. Fascinating. It was all so tidy compared with the Model I—no messy external power supplies or expansion interfaces with vulnerable cables dangling out of the back. A screened metal compartment and printed circuit board reduced radio frequency interfer-

ence as per FCC regulations. The cassette interface has been redesigned into some semblance of reliability. The keyboard was somewhat inelegant but it had an important something over its predecessor—no keybounce.

A noticeable feature of the circuit board was preponderance of Motorola integrated circuits. And what was this new chip? A 6809E microprocessor, a long overdue improvement on the Z80. The Color Computer was a very interesting piece of hardware but for a while remained little more than a curiosity as the Model I continued to reign supreme.

Radio Shack can never be accused of standing still. They are a very tight-lipped organization with a more effective control of information leaks than the White House. In Mohammed Ali style, they were about to deliver a one-two. The one had been the Color Computer, and the two was the Model III, a grown up, fully mature Model I—once again, a tidy piece of equipment with nothing more than a power cord for an external cable. While TRS-80-ville was admiring this latest addition to the product line, the Color Computer had begun to defy the critics, and demand had outstripped supply. Fort Worth had started playing hardball, and life in the TRS-80 lane would never be quite the same again.

With the addition of several species of pocket computer, the Model 12, the Model 16, the Model 100, the Model 2000, and various upgrades of the Color Computer, the term TRS-80 is no longer a specific definition. It now refers to whole product line rather than just one or two machines.

Even the microprocessors used in the various machines vary enormously, ranging from the 8085 in the Model 100 to the 80186 in the Model 2000. All this has important implications for a columnist with the task of writing a "TRS-80 column."

Future Columns

Ok, so there's the excuse. Now what to do about it. Well, I'm hoping to take up some of the slack left by the departure of *The Color Computer Magazine* from the scene. So I definitely intend to cover that machine as a priority. Next on the list, place the Model I/III/4 crowd.

My main workhorse is a trusty old Model III running under LDOS, but I still use my original Model I for many tasks. The sheer volume of Model I software I own precludes me ever ditching the machine. I probably have four times more money invested in Model I software than I do in Model I hardware. Naturally, much of that software will work on the Model III, but you know the name of that game: you can never count on compatibility until you've tried it. Much of the machine code software dosen't transfer across because of direct accesses to the floppy disk controller (which is handled differently on the Models I and III).

Radio Shack can never be accused of standing still. They are a very tight-lipped organization with a more effective control of information leaks than the White House.

Machine code software in both 6809 and Z80 is something I'll try to give some space to. I was professionally dragged up through the ranks of operating systems maintenance on a Honeywell 6000 mainframe, and this has influenced my outlook on computing to this day.

I particularly enjoy nudging my way into the operating system of a microcomputer and convincing it to behave in a different and hopefully more sophisticated manner. I have several pieces of software both in Basic and machine code which have been waiting for a suitable opportunity to be aired.

Listing 1.

```
10 CLS0
20 A$(1)="CEGCEGCEGCEGG":A$(2)="
CEACEACEACEA":A$(3)="CDAFCDAFCDA
F":A$(4)="DEBGDEBGDEBG":A$(5)="C
CCEEEEGGGG":A$(6)="CCCCEEEEAAAA
":A$(7)="CCCDDDAAAFFF":A$(8)="DD
DBBBEEEGGG"
30 R=RND(3):IFR=1 THENX$="":FORZ
=1TORND(51):X$=X$+CHR$(RND(7)+64)
:NEXT
40 FORX=255TO80STEP-16
50 IFR=1 THEN60ELSEIFR=2 THENZ=R
ND(4)+4 ELSEZ=RND(8)
55 X$=A$(Z)
60 O=X/43:V=(X-60)/7
70 PLAY"V=V;O=O;L=X;XX$;
80 NEXT:FORZ=1TO4:PLAY"V-XX$;":N
EXT:GOTO30
```

Reviews

Reviews are another possibility dependent upon both the availability of review material and space in the column. For my own personal taste, I find computing per se at least as exciting (if not more so) than staying abreast of the latest developments in the industry.

For the Color Computer and Models I/III/4, I'll be glad to pass on any impressions of the latest pieces of software or hardware. To this end, if you are a product developer and would like me to take a look at your latest offering, you can send it to me direct at P.O. Box 495, Peterborough, NH 03458 or via the magazine at 39 East Hanover Ave., Morris Plains, NJ 07950. I can't guarantee inclusion; it all depends on availability of space. Of course, if I see a blockbuster of a product, how could I refuse?

Another source of information is hopefully going to be Fort Worth itself. I make it a point to stay in touch with Ed "I know nothing" Juge, Tandy's director of market planning, and he makes it a point to tell me as little as possible in keeping with their policy of not talking about a product until it exists. This is all very laudable but extremely frustrating and usually ends up with me trying to analyze everything he says over the phone to see if he has inadvertently given me a clue to some wonderful new product. I'll try my best.

It's your column. I aim to please. Let me know what you want to see in it. I am epecially interested to know how much review material you want to see.

Playing with your Color Computer

It's your column. I aim to please. Let me know what you want to see in it. I am especially interested to know how much review material you want to see.

Well, after that lengthy introduction, I guess I ought to leave something in my wake other than an empty space, so this small program is included as a tidbit for Color Computer owners. It is the result of some experiments I tried when I first got my Color Computer.

I wanted to put the PLAY command through it paces and see if I could get anywhere close to playing a chord. This is, unfortunately, impossible from Basic on a machine with a single voice, as you need at least three to get a chord. So the

idea was to experiment with arpeggios to see if playing them very fast would convince the ear that it was hearing a chord.

Well it doesn't, but in discovering that I ended up with a program that sings like a castrated nightingale that knows no dawn. I also found out something about the PLAY command that is not in the manual.

According to the manual, the variables contained within the quoted PLAY string (such as octave and volume) must be followed by a numeral. This struck me right away as a little awkward if you wanted to manipulate one of the parameters, say, the volume. To do this as per the instructions in the manual, you would have to change the appropriate numeral within the string. For example, you might have to change V=10 to V=9. It would be much simpler if you could just say V=VL where VL is any variable name containing the volume or other parameter desired.

It turns out you can do just that as long as you append a semicolon to the variable names as in V=VL;. This works not only for all the numeric parameters in the PLAY command, but in the DRAW command too.

Here is a line-by-line breakdown:

Line 10 blanks the screen.

Line 20 initializes eight arpeggios. The whole program is based around the four-chord progression C Am F6 G6. The first four arpeggios are a fast rendering of these, and the second four play a slower arpeggio.

Line 30 makes a random choice R of the type of arpeggio to be played. If R=1, then the arpeggio is not one of the four named above but up to five random notes in the key of C.

Line 40 initializes the echo loop.

Line 50 chooses the arpeggio according to the variable R. If R=1, the arpeggio is already set up. If R=2, then a slow arpeggio is picked. If R=3, one of the eight arpeggios is chosen.

Line 55 assigns the chosen arpeggio to the variable X$ (unless already assigned in line 30).

Line 60 scales the octave (one to five) and the volume (1-31) as per the echo-repeat variable, X.

Line 70 plays the arpeggio selected.

Line 80 completes the echo loop, then fades out as four more of the last arpeggios play.

There you have it. It won't balance any checkbooks or fix any of your lost directories. It is strictly for amusement, and I defy you to whistle any of the tunes it invents. ■

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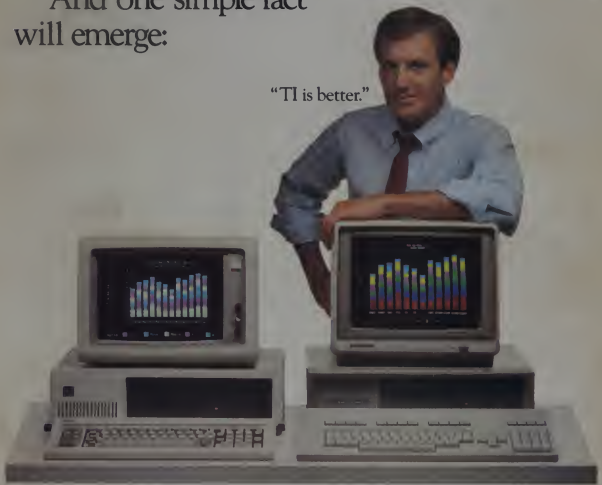

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